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Oil and Gas Development within the BISTI/DE-NA-ZIN WILDERNESS

DRAFT ENVIRONMENTAL IMPACT STATEMENT

January 1999

Prepared by
UNITED STATES DEPARTMENT OF THE INTERIOR
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Oil and Gas Development Within the Bisti/De-Na-Zin Wilderness
Draft Environmental Impact Statement

Abstract: This Draft Environmental Impact Statement (DEIS) describes and analyzes various alternatives and a Proposed Action by Speerex, Ltd. to drill 13 oil or gas wells on two leases within the Bisti/De-Na-Zin Wilderness. The Proposed Action is entirely within San Juan County, New Mexico. A Preferred Alternative will not be identified until the Final Environmental Impact Statement and Record of Decision is issued.

Type of Action: (X) Administrative ( ) Legislative

For further information, contact:
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Date filed with the Environmental Protection Agency: January 29, 1999.

Comments on the DEIS must be received no later than: April 30, 1999.

Recommended:

Lee C Otteni 1/19/99
Lee C. Otteni date
Field Office Manager
Farmington Field Office

Approved:

1/19/99
M. J. Chávez date
State Director
New Mexico State Office

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, New Mexico 87401

Dear Reader:

Enclosed for your review is the Draft Environmental Impact Statement (DEIS) on Oil and Gas Development Within the Bisti/De-Na-Zin Wilderness. This document describes and analyzes various alternatives and a Proposed Action by Speerex, Ltd. to drill 13 oil or gas wells on two leases within the Bisti/De-Na-Zin Wilderness in San Juan County, New Mexico. Preparation of this DEIS is a result of a joint stipulation between Speerex Ltd., *et al*, Plaintiffs, and the United States of America, Defendant, in the United States Court of Federal Claims, Case No. 97-351L. Therefore, no Preferred Alternative will be identified until the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) is issued. It is expected that the FEIS will be issued in October, 1999 and the ROD delivered in February, 2000.

Those wishing to comment on this Draft should do so in writing by **April 30, 1999**. Comments should be sent to:

Lee C. Otteni, Field Office Manager
BLM Farmington Field Office
1235 La Plata Highway, Suite A
Farmington, NM 87401

All comments will be considered in preparation of the Final Environmental Impact Statement.

Sincerely,

Lee Otteni

Lee C. Otteni
Field Office Manager

Enclosure

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SUMMARY

The Proposed Action by Speerex Ltd, is to drill thirteen wells on two leases within the Bisti/De-Na-Zin Wilderness. As mitigated by the stipulations included in this Environmental Impact Statement, approximately 6.8 miles of new road would be constructed. Construction would be the minimum necessary to access the well pads with drilling rigs until the wells are deemed capable of producing oil or gas. If the wells prove to be economical, roads would be upgraded to the minimum necessary, and up to approximately 8.2 miles of surface pipelines would be authorized. In addition, the Proposed Action would grant off-lease Rights-of-Way (ROW's) totalling 8,137 feet. The proposed project is entirely all new disturbance with the exception of 7,344 feet of existing road on Federal Surface (within the Wilderness) 1.3 miles south of County Road 7250 that accesses the Hunter Wash No. 1 well drilled in 1991.

Physical disturbance by the Proposed Action, as mitigated, is estimated at 23.4 acres (6 acres are not vegetated) and 24,370 cubic yards of rock and soil. Impacts to many of the resources in the area would be both short- and long-term. As mitigated, the only known, permanent impacts would be to topography and soils.

Under the No Action Alternative -- the denial of the Speerex Applications for Permit to Drill (APD's) -- Speerex would not have the opportunity to create a profit on its investment, and the Federal government would receive no royalty payment. Denying drilling and production of these wells would mean no additional employment opportunities would be created for oilfield workers. However, in light of production tests and records from the Hunter Wash No.1 and other nearby wells, it is by no means certain that these economic benefits would be realized if the no action alternative were to be rejected.

Alternative A analyzes the impacts of approving the APD's but denying the ROW's. Physical disturbance to Federal lands under Alternative A is estimated at 21 acres (7.5 acres are not vegetated) and 13,010 cubic yards. As with the Proposed Alternative, impacts to many of the resources in the area would be both short- and long-term. As mitigated, the only known, permanent impacts would be to topography and soils.

Other alternatives, including a Mineral Lease Exchange, are mentioned, along with a rationale for their not being analyzed in this document.

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I. INTRODUCTION

Purpose and Need

This Environmental Impact Statement (EIS) is written to address the impacts of thirteen oil and gas wells on two leases held by Speerex Ltd. (Speerex) within the Bisti/De-Na-Zin Wilderness. The preparation of this EIS is a condition of the Joint Stipulation between Speerex Ltd. *et al* and the United States of America filed in the U.S. Court of Federal Claims pertaining to Case No. 97-351L.

In May 1991, the Bureau of Land Management (BLM) issued the "Hunter Wash" and "Coyote" oil and gas leases to Speerex (see Location, below). At the time, the surface was Navajo Tribal Trust land administered by the Bureau of Indian Affairs. Speerex paid a bonus of $29,750 for the Hunter Wash Lease and $21,420 for the Coyote Lease. The leases had standard provisions for a five year primary term, a 12.5% royalty, and annual rentals of $1.50 per acre.

In October 1991, BLM approved an Application for Permit to Drill (APD) the Hunter Wash No. 1 well. Speerex completed this well in December 1991, and claimed an initial production of 200 thousand cubic feet of gas per day (MCFD) based on an extrapolation of a 5-hour well test. The well was then shut-in.

In December 1991, the surface estate of the Speerex leases, along with other lands between the Bisti and De-Na-Zin Wildernesses (which had been designated as wilderness in October 1984), was exchanged to the BLM for other public lands in New Mexico. In April 1992, the BLM designated this land as part of a Potential Area of Critical Environmental Concern, and a bill (S. 2965) was introduced by Senator Pete Domenici in July 1992 to add this land to the existing wildernesses.

In April 1992, Speerex filed APD's on the Hunter Wash No. 2 and No. 3, and the Coyote No. 1 wells. In December 1992, the BLM issued an Environmental Assessment (EA NM-019-92-3229) with a Decision Record that concluded that further oil and gas development would have significant impacts on the potential wilderness and "implementing all specific stipulations and/or mitigating measures [analyzed in the EA] would be insufficient to produce a Finding of No Significant Impact." All EA's which cannot issue a Finding of No Significant Impact (FONSI), necessitate an EIS before a decision can be made on the Proposed Action. The Preferred Alternative in the EA was a mineral lease exchange, but at that time BLM believed it had no authority to exchange oil and gas leases.

In January 1993, BLM issued EA NM-070-93-3006. The accompanying Decision Record authorized a surface pipeline for the production of Speerex's Hunter Wash No. 1 well. To date, Speerex has not installed this pipeline.

Speerex was granted an indefinite suspension of these two leases in September 1993, which "stopped the clock" on both the expiration of their lease and their annual rental payments. In August 1994, BLM proclaimed a moratorium on further oil & gas development on the project lands. The moratorium was to last three years or until Congress granted the authority to exchange oil and gas leases, whichever came first.

In November 1996, Public Law 104-333 was signed, creating the expanded Bisti/De-Na-Zin Wilderness (B/DNZ). The land designated as wilderness by this act included the Speerex leases. Public Law 104-333 (see APPENDIX A) includes the statement: "Operations on [existing] oil and gas leases...shall be subject to the applicable provisions of Group 3100 of title 43, Code of Federal Regulations (including section 3162.5-1), and such other terms, stipulations, and conditions as the Secretary of the Interior considers necessary to avoid significant disturbance of the land surface or impairment of the ecological, educational, scientific, recreational, scenic, and other wilderness values.... In order to satisfy valid existing rights..., the Secretary of the Interior may exchange any oil and gas lease within this area for an unleased parcel outside this area...."

In May 1997, Speerex filed suit in Federal Claims Court (Case No. 97-351L), claiming their lease rights had been taken by the creation of the B/DNZ. By agreement in a Joint Stipulation between Speerex and BLM signed in December 1997, Speerex agreed to submit complete APD's for "such wells as it proposes for the Hunter Wash and Coyote Leases," and BLM will complete an EIS as mandated by the National Environmental Policy Act (and consistent with the Decision Record accompanying EA NM-019-92-3229). This Joint Stipulation mandates that the EIS, and a Record of Decision (ROD), will be completed within 24 months of the submission of complete APD's. The Joint Stipulation also states: "The decision of the BLM on each APD will be (a) to approve the APD as submitted; or (b) to approve the APD subject to specific conditions of approval; or (c) deny the APD. In the event that the decision on any APD is to *delay* approval or denial..., then such a decision shall be deemed a denial of the APD for all purposes [of the lawsuit]."

This document is the draft of the EIS that will be the basis for the ROD on the Speerex APD's. After public comment and any necessary revisions, it is expected the Final EIS will be issued in October 1999, and the ROD issued no later than February 2000.

Location

The Speerex leases are in San Juan County, New Mexico, approximately 30 miles south of Farmington. See MAPS (Section IX of this EIS).

The Hunter Wash lease (NM-86489), totalling 849.88 acres, is:
T. 24 N., R. 12 W.,
Sec. 3: Lots 8, 9, 16, 17;
Sec. 4: Lots 5-20 (all).

The Coyote lease (NM-86490), totalling 764.18 acres, is:
T. 24 N., R. 12 W.,
Sec. 8: Lots 1, 2, 7-16;
Sec. 9: Lots 3-6, 12, 13.

Relationship to BLM Policies, Plans, and Programs

This document is written in accordance with the following applicable laws and regulations:

Mineral Leasing Act of 1920, as amended;
Wilderness Act of 1964 (Public Law 88-577);
National Environmental Policy Act of 1969 (P.L. 91-190);
Federal Land Policy and Management Act of 1976 (P.L. 94-579);
San Juan Basin Wilderness Protection Act of 1984 (P.L. 98-603);
Omnibus Parks and Public Land Management Act of 1996 (P.L. 104-333);
Code of Federal Regulations Title 40, Part 1500; and
Code of Federal Regulations Title 43, Part 3100, and Subpart 8560.

II. ALTERNATIVES

Introduction

This chapter outlines the Proposed Action as submitted by Speerex Ltd. in their amended APD's, and two alternatives, including the "no action" alternative as required by 40 CFR 1502.14. Also listed are several alternatives which were eliminated from further study, along with the rationales for their elimination.

As allowed in 40 CFR 1502.14(e), no agency preferred alternative is identified in this Draft EIS.

Proposed Action

Speerex Ltd. proposes to drill thirteen (13) wells within their federal oil and gas leases NMNM 86489 and NMNM 86490 located in San Juan County, New Mexico. Applications for Permit to Drill (APD's) (form 3160-3) for these wells were received by the Farmington Field Office (FFO) on January 22, 1998. To lessen environmental damage and decrease visual impacts, Speerex agreed to move the locations of five of these wells, and submitted revised partial APD's on June 22, 1998. The last of the APD's was completed on October 13, 1998. The proposal includes drilling eight (8) vertical wells to test the Gallup formation and five (5) vertical wells to test the Fruitland Coal formation, all on pads 150 feet by 150 feet. The Proposed Action includes the construction on federal land of approximately 6.8 miles of new roads in a 20-foot wide construction zone. The APD's state a separate request for pipeline rights-of-way (ROW's) will be made "if commercial production is established." The analysis of the Proposed Action assumes that such production will be established at all wells, necessitating 8.2 miles of pipeline on federal land. Small-diameter pipelines typically have a 40-foot wide ROW; for the purposes of this Proposed Action, it is assumed that the pipeline ROW will overlap the 20-foot vehicle access ROW. The APD's are also serving as an application to obtain access road ROW's from the BLM where proposed routes cross Federal land outside the boundaries of the leases. In addition, the Proposed Action assumes pipeline ROW's for these off-lease portions as well.

It is expected that it would take approximately seven days to drill each Fruitland well and approximately fifteen days to drill each Gallup well; it is unlikely that any two wells would be drilled simultaneously. In addition, it is assumed that each Fruitland well would have to be visited by a truck to haul off produced water every other day, and all wells would likely receive a weekly maintenance inspection; occasional additional trips to locations for repairs make the total number of vehicle trips to the project area approximately 20 per week.

The following are the proposed wells and well information within the respective leases (see MAPS in Section X of this EIS):

NMNM86489 (Hunter Wash lease)

Hunter Wash No. 2
sec. 4, T24N, R12W
1075' FNL 1060' FEL
Fruitland Coal formation
Proposed depth 950'

Hunter Wash No. 3
sec. 3, T24N, R12W
2210' FNL 585' FWL
Fruitland Coal formation
Proposed depth 900'

Gold No. 1
sec. 4, T24N, R12W
1650' FNL 2100' FWL
Gallup formation
Proposed depth 4,000'

Gold No. 2
sec. 4, T24N, R12W
1140' FNL 1150' FWL
Gallup formation
Proposed depth 4,000'

Gold No. 3
sec. 4, T.24N, R12W
2340' FNL 2010' FEL
Gallup formation
Proposed depth 4700'

Gold No. 4
sec. 4, T24N, R12W
1655' FSL 550' FEL
Gallup formation
Proposed depth 4,650'

Gold No. 5
sec. 3, T24N, R12W
980' FSL 615' FWL
Gallup formation
Proposed depth 4,600'

NMNM86490 (Coyote lease)

Coyote No. 1
sec. 8, T24N, R12W
790' FNL 990' FEL
Fruitland Coal formation
Proposed depth 735'

Coyote No. 2
sec. 9, T24N, R.12W
2290' FSL 800' FWL
Fruitland Coal formation
Proposed depth 800'

Coyote No. 3
sec. 8, T24N, R12W
2,500' FSL 1,600' FWL
Fruitland Coal formation
Proposed depth 800'

Barns No. 1
sec. 9, T24N, R12W
450' FNL 2040' FWL
Gallup formation
Proposed Depth 4,650'

Barns No. 2
sec. 8, T24N, R12W
1980' FSL 770' FEL
Gallup formation
Proposed depth 4,500'

Barns No. 3
sec. 8, T24N, R.12W
790' FSL 790' FWL
Gallup formation
Proposed depth 4,400'

"No Action" Alternative

Under this alternative, all thirteen APD's and all rights-of-way would be denied. Speerex would be allowed continued access to their existing Hunter Wash No. 1 well without a right-of-way. If Speerex chose to produce Hunter Wash No. 1, they would be permitted to use the approved surface pipeline analyzed in EA NM-070-93-3006.

Alternative A: approve APD's but deny ROW's

The Proposed Action requires three rights-of-way (ROW's) -- off-lease vehicle or pipeline routes

-- across public land. Hunter Wash lease requires a ROW of 3,251 feet in T. 24 N., R. 12 W., Section 5, NE¼. The Barns No. 1 well on the Coyote lease requires a 2,184-foot ROW in T. 24 N., R. 12 W., Section 4, SW¼. (Though this access route is on the Hunter Wash lease, it is necessary for the development only of the Coyote lease, and therefore is not part of the on-lease rights granted with the Hunter Wash lease.) The remaining wells on the Coyote lease require a ROW of 2,702 feet in T. 24 N., R. 12 W., Section 4, SW¼ and Section 5, SE¼ (1,279 feet on the Hunter Wash lease and 1,423 feet off either lease).

The issuance of a Federal oil and gas lease carries with it neither an expressed or an implied right of access to the leasehold. In addition, there is adequate (and less environmentally damaging) access to the leases across land outside the wilderness or land whose surface is not regulated by FLPMA. For the purposes of the analysis of this alternative, it is assumed that: the proposed wells on the Coyote lease would be accessed by an existing primitive route that leads to the Coyote No. 3 well from outside the wilderness to the northwest; the Hunter Wash No. 1 and Gold No. 1 and No. 2 locations would be accessed by the surface pipeline corridor permitted in EA NM-070-93-3006; and the Hunter Wash No. 2 and No. 3 and the Gold No. 3, No. 4, and No. 5 would be accessed by the right-of-way to the Hunter Wash No. 2 originally requested in Speerex's 1992 APD for that well. See MAPS in Section X of this EIS.

Under this alternative, the APD's would be approved but the requested ROW's required for surface access to the two leases would be denied. Additional ROW's outside the wilderness would be required, as they would be for any development proposed by Speerex. However, as oil and gas development infrastructure outside the Bisti/De-Na-Zin Wilderness is not within the scope of this EIS, no ROW's outside the wilderness are examined in this document.

Alternatives considered but dropped from detailed analysis

Mineral Lease Exchange: In December of 1992, the Farmington Resource Area Office prepared an Environmental Assessment (EA NM-019-92-3229) on oil and gas development in a project area which included the Speerex leases. The Finding of No Significant Impact was contingent upon a mineral lease exchange. The Decision Record said, in part, that the BLM "will seek to effect mineral leases (sic) exchanges with the affected lease holders....Exchanges for leases within the [project area] will be for unleased parcels outside...of like mineral estate and with appraised similar mineral values." These unleased parcels were identified in EA NM-019-92-3229, as amended in EA NM-070-93-3003.

Congress granted the authority to conduct such a mineral lease exchange in P.L. 104-333 Sec. 1022(b)(4)"(e)(3)": "In order to satisfy valid existing rights..., the Secretary of the Interior may exchange any oil and gas lease within this area for an unleased parcel outside this area of like mineral estate and with similar appraised mineral values."

However, a mineral lease exchange requires willingness on the part of the lease holder. Speerex Ltd. has chosen not to pursue an exchange. Consequently, and in light of the adequate environmental assessment in EA NM-019-92-3229, this alternative is not analyzed further.

Approve Gallup APD's but deny Fruitland APD's: Recent court cases have questioned whether coal gas (such as that produced by the Fruitland Formation) is part of the coal estate or is conveyed with the estate of the other leasable minerals; Speerex does not have a coal lease. However, it is BLM's policy that when the federal government owns both mineral estates, the gas produced from coal beds is leased with the other oil and gas minerals. As this is the case with the Speerex leases, this alternative is dropped from further consideration.

Directional drilling: Several members of the public have suggested requiring Speerex to locate their well pads outside the Wilderness, thereby mitigating surface disturbance. Technical feasibility aside, the BLM does not have the authority to require a lessee to move well pads off lease unless such a move is provided for in the lease stipulations. Such a move would have to be voluntary on the part of Speerex. Since the Speerex leases are both entirely within the Bisti/De-Na-Zin Wilderness, BLM cannot mitigate impacts to wilderness values by moving the well pads to a location outside the wilderness. This alternative is therefore dropped from further consideration.

Change Wilderness boundary: One member of the public suggested amending the boundary of the Bisti/De-Na-Zin Wilderness to exclude the Speerex leases. Only Congress can change Wilderness boundaries, and such an alternative is not within the BLM's authority. Therefore, it is dropped from further consideration.

Re-purchase Speerex Leases: Several members of the public suggested buying back the Speerex leases by returning the fees Speerex paid at the time of the lease sale and the royalties the company has paid since. It is doubtful Speerex would agree to sell the leases back to the Federal Government at cost, and this alternative is dropped from further consideration.

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III. AFFECTED ENVIRONMENT

Introduction

The area covered by the Speerex leases is a mix of unvegetated badlands and sparsely vegetated grasslands near the head of Hunter Wash. There are very few of the photogenic hoodoos for which the former Bisti Wilderness section of the B/DNZ is known, but petrified logs and dinosaur fossils are readily apparent to the casual eye. The view from the higher elevations of the project area is stunning -- from the Chuska Mountains to the west, southeast to Mount Taylor over eighty miles away. Very few visitors make it to this remote corner of the Bisti/De-Na-Zin Wilderness.

The closest climatological monitoring station is at Chaco Culture National Historical Park, approximately twenty miles southeast of the project area. Precipitation averages approximately 9 inches per year, coming primarily in the form of summer isolated thunderstorms. On average, 1.7 inches of the total precipitation fall in the form of approximately 17 inches of snow between late October and April. The Badland soils are particularly slippery and susceptible to severe rutting when wet. Temperatures range from average July highs in the low 90's to January lows around 15^0 (Fahrenheit). The range between daily highs and lows are usually in excess of thirty degrees.

No prime or unique farmlands, wetlands or riparian zones, or wild and scenic rivers are affected by the Proposed Action.

Geology & Soils

The project area is geologically described as containing the nonmarine strata of the pre-Naashoibito portion of the Kirtland Formation, underlain by the coal-rich Fruitland Formation. These strata were formed at the end of the Cretaceous Period, the last of what is commonly known as The Age of Dinosaurs.

The pre-Naashoibito portion of the Kirtland Formation is hard to date precisely on the basis of vertebrate fossils because of a geological unconformity and our present uncertainty about the depositional process at the time. However, radiometric dates, palynology, and the conformable position between known strata (Hunt and Lucas, 1992) suggest that the exposed rocks of the project area were formed 65-70 million years ago.

The De-na-zin Member of the Kirtland Formation is about 30 m thick in its type area (NW1/4 Section 19, T. 24 N., R. 11 W.) and consists of green mudstone, siltstone and minor sandstone. It forms a slope break between the older Farmington Member and the lower conglomerate of the younger Naashoibito Member.

The Farmington Member of the Kirtland Formation consists of conglomeratic mudstone and siltstone. It also includes a brittle yellowish unit overlain by a brown, iron-rich upper portion. The Farmington Member is of fluvial origin, dominated by crossbedded sandstones with erosional bases, with abundant nonmarine fossils such as dinosaurs and plants.

The Hunter Wash Member includes all the fine-grained strata between the Bisti Member and Farmington Member of the Kirtland Formation. It is about 375 m thick in its type area (Sections 23-26, 27-28, 33-34, T. 24 N., R. 13 W., and Sections 8-9, 16-20, T. 24 N., R. 12 W.). It consists of green and gray siltstones and mudstones; thin carbonaceous mudstones and coals; white lenticular, crossbedded sandstone; and rare, thin, air-fall volcanic ashes. The Hunter Wash Member represents deposition by winding streams in a subsiding basin as indicated by the presence of isolated single story channels surrounded by large volumes of fine-grained overbank sediments.

Most of the surface of the Speerex leases is the BADLAND soil type -- rapidly eroding silts and clays, and non-stony barren shale uplands that are dissected by deep intermittent drainages and gullies (Keetch, 1980). On-site inspection indicates that as much as 25% of the Hunter Wash lease may have soils typical of the neighboring uplands, the DOAK-SHEPPARD-SHIPROCK and SHEPPARD-HUERFANO-NOTAL complexes. These fine sandy loams are relatively deep and very well drained, formed in water- or air-borne deposits derived from sandstone and shale. The hazard of water erosion is slight to moderate due to the relatively gentle slopes of these soils; however, the hazard of wind erosion is moderate to very severe.

Air Quality

The project area is in a designated Class II area under the Clean Air Act (CAA). Federal and State of New Mexico Class II air quality standards can be found in APPENDIX B. The New Mexico Environment Department (NMED) tracks concentrations of criteria pollutants in the air through a network of monitoring stations located across the state. While an air monitoring station does not exist at the wilderness area, there are five monitoring sites around Farmington, NM. Most monitoring stations measure only those criteria pollutants that are likely to be at high levels at that station. According to the NMED, San Juan County is in compliance with the ambient air quality standard for these pollutants.

In addition to regulating criteria pollutants, the Environmental Protection Agency also regulates hazardous air pollutants (HAP's). Industries are required to control their emissions of known hazardous substances by using low-polluting technology. Although hazardous air pollutants such as benzene, ethylene glycol, methanol, and gasoline vapors, may be emitted in small amounts at the well level, the emissions from wells, their associated equipment, pipeline compressors, and pump stations cannot by law be aggregated for the purpose of considering them a "major source" (defined in 42 USC Sec. 7412 as any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has potential to emit 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants).

A post-construction operating permit, is required for any major source that has the potential to emit 100 tons per year or more of any regulated pollutant, 10 tons per year or more of any single HAP, or 25 tons per year or more of any combination of HAP's. With the exception of some compressor units, the equipment used in the drilling, completion, and production of a well will generally emit pollutants into the air at a level that is low enough (less than 10 tons a year) that they do not require any type of permit from the State. Information compiled by a local oil and gas company shows that of over 150 locations inventoried, not one location had a total estimated emission rate of over 10 tons a year for any single or combined criteria pollutant (Price, 1998).

The CAA as amended in 1990 allows for a national wilderness area established after 1977 and greater than ten thousand acres in size to be reclassified by individual States as Class I. There currently are no plans to redesignate the Bisti/De-Na-Zin Wilderness from a Class II area to a Class I area, a process that would involve local, state, and federal officials.

Noise

A sound survey/analysis performed in August 1995 at three areas along the western edge of the Bisti Wilderness showed the area to be naturally quiet, with an average daytime sound level ranging from 23.8 dBA to 28.2 dBA. "Primary noise contributors were the periodic noise of birds/insects, the noise of distant vehicle traffic, very distant aircraft noise, and the noise of wind blowing in grass" (Kiteck, 1996). This natural quiet enhances recreation opportunities and wilderness values. As a result, BLM required the Bisti Compressor Station, a 10,000 horsepower motor operated by Transwestern Pipeline Company approximately ⅔ mile from the B/DNZ boundary, to be muffled in such a way that it was inaudible at the wilderness boundary.

In January 1999, simple sound surveys were conducted in the project area. Decibel readings varied from averages of 33.3 to 35.3 dBA. At all locations, the sound of a pumpjack in the distance was apparent. In the eastern portion of the B/DNZ, where the Bisti Oil Field development approaches the northern boundary of the wilderness, pumpjacks can be heard under still wind conditions at least four miles, and the 1999 survey found a reading of 32.9 dBA in such a location. Two unmuffled pumpjacks, one of which is believed to be the one heard in the project area (2½ miles distant upwind)) were located, with average decibel readings taken at varying distances: at the source: 90 to 96.8 dBA; at 50 feet: 65.6 to 70 dBA; at 100 feet: 58.5 to 58.9 dBA. The noise from one well dropped to 36 dBA at 850 feet; noise from the other well dropped to 33.9 dBA at 500 feet and 33.0 dBA by 1600 feet. Aural perception in quiet locales of distant pumpjacks is clearly not a matter of decibel level, but of the unnatural nature of the sound in a natural environment.

Water

In the San Juan Basin, water from precipitation and stream channel loss percolates into the ground-water flow system. This downward flow is discharged in widely scattered natural areas such as springs, seeps, faults, and fractures, and in anthropogenic sources such as flowing or pumped wells, or open pit mining operations. The aquifers that are used most frequently to supply water to industry, communities and livestock have been located in the Gallup, Dakota, and Morrison formations. Other shallow aquifers have been used for domestic and livestock purposes where water quality criteria are conducive for that particular need. Aquifers in the Kirtland, Fruitland, Pictured Cliffs, Cliff House, Menefee, and Point Lookout Formations are not useable. Sodium is the predominant dissolved ion in water from all these rocks of the Cretaceous age. Other mineral ions include calcium, chloride, sulfate, and bicarbonate. The specific conductance of the water from these aquifers varies considerably ranging from approximately 1,000 umhos to over 30,000 umhos. The largest contributor to the water chemistry in this unit is the brine waters associated with oil and gas accumulations.

Their are no perennial rivers or streams near the project area. Hunter Wash, one of the major tributaries of the Chaco River (which is in turn a tributary of the San Juan River), passes through both Speerex leases. Two of the proposed wells, Coyote No. 3 and Barns No. 3, are within the Special Flood Hazard Area designated in 1977 by the U. S. Department of Housing and Urban Development's Federal Insurance Administration. Streamflow in Hunter Wash occurs in direct response to infrequent precipitation. Most of the precipitation in the area usually falls during intense summer thunderstorms, which readily erode particles from sparsely vegetated land. Sediment yield in the project area can exceed 3 acre-feet per square mile (Roybal, 1983). Active headcutting that deepens and lengthens a channel is common throughout this area. Conservative erosion estimates approach .5 cm per year when averaged throughout the area (Wells, 1981). Flows here register high sodium and other salinity values, as well as an alkalinity due to the presence of bicarbonates resulting in pH values over 8. Conductivity ranges from 100 to 5,000 umhos. The average suspended sediment concentrations ranges from 10,000 to 100,000 ppm.

The U. S. Geological Survey has placed a stream gauge where Hunter Wash leaves the B/DNZ. In five out of seven years measured (1974 through 1981), the flow of one precipitation event exceeded or nearly reached 100 cubic feet per second (with a maximum flow of 168 cfs on September 24, 1978). During these events, sediment load exceeded 200 grams per liter. Thus, in most years there is one flood in Hunter Wash that removes at least one half ton per second of sediment from the 45 square miles drained by this ephemeral stream.

Vegetation (including Threatened or Endangered Plants)

Much of the project area is unvegetated badlands (see GEOLOGY & SOILS, above). However, a wide range of low plants can be found despite poor soil and low rainfall. Surveys of wellpad locations conducted during on-site visits found shrubs (including sand sagebrush (*Artemesia filifolia*), four-winged saltbush (*Atriplex canescens*), rabbitbrush (*Chrysothamnus greenii* and *C. nauseous*), Mormon tea (*Ephedra torreyana*), and broom snakeweed (*Gutierrezia sarothrae*)), forbs (including goosefoot (*Chenopodium sp.*), buckwheat (*Erigeron sp.*), halogeton (*Halogeton glomeratus*), stickleaf (*Mentzelia sp.*), pale evening-primrose (*Oenothera pallida*), Russian thistle (*Salsola iberica*), broom groundsel (*Senicio spartoides*), and globemallow (*Sphaeralcea sp.*)), and grasses (including blue grama (*Bouteloua gracilis*), galleta (*Hilaria jamesii*), Indian ricegrass (*Oryzopis hymenoides*), muhly (*Muhlenbergia sp.*), alkali sacaton (*Sporobolus airoides*), six-weeks fescue (*Vulpia octoflora*), and cheatgrass (*Bromus tectorum*)).

In addition to these common plants, the project area possesses excellent potential habitat for a designated Species of Concern: the newly-discovered Bisti fleabane (*Erigeron bistiensis*). Two plants identified as San Juan milkweed (*Asclepias sanjuanensis*) were found in the proposed route accessing the Barns No. 1 well. The U.S. Fish & Wildlife Service has not yet determined whether plants described as *Asclepias sanjuanensis* are indeed a separate species or a sub-species population, nor has that agency determined if they deserve listing as Threatened or Endangered.

A third species, Mancos saltplant (*Proatriplex pleiantha*), has been considered a Species of Concern, but recently has been found to be more abundant than previously thought. Its listing is currently under review by the New Mexico Rare Plant Technical Council.

There are no known listed threatened or endangered species of plants (and no critical habitat has been designated for listed species) within the project area. The Proposed Action would not trigger formal consultation with the US Fish & Wildlife Service (see APPENDIX C).

Wildlife (including Threatened or Endangered Animals)

Fauna is limited by the sparse vegetation. Several orders of arthropods are represented, as are many species of reptiles, including the Western rattlesnake (*Crotalus viridis*). The largest mammals commonly present are the blacktailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus auduboni*), and coyote (*Canis latrans*). Mule deer (*Odocoileus hemionus*) have been seen in the project area, and the kit fox (*Vulpes macrotis*) may be present. Pronghorn antelope (*Antilocapra americana*) are believed to be extirpated from the area.

The most abundant birds include: Say's phoebe (*Sayornis saya*), horned lark (*Eremophila alpestris*), common crow (*Corvus brachyrhynchos*), rock wren (*Salpinctes obsoletus*), and black-throated sparrow (*Amphispiza bilineata*).

A Species of Concern bird extremely sensitive to human disturbance, the ferruginous hawk (*Buteo regalis*), is known to nest in the B/DNZ. One unoccupied nest was found in the project area during on-site inspections in May 1998. Other raptors that frequent the area include the golden eagle (*Aquila chrysaetos*), prairie falcon (*Falco mexicanus*), and burrowing owl (*Athene cunicularia*). The 1998 survey by Hawkwatch found no nesting raptors in the project area.

There are no known listed threatened or endangered species of animals (and no critical habitat has been designated for listed species) within the project area. The Proposed Action would not trigger formal consultation with the US Fish & Wildlife Service (see APPENDIX C).

Livestock Grazing

The project area is largely within the grazing allotment of Lorena Begay, Thomas Yazzie, Andrew Werito, and Lilly Chee (#5160). Their year-long lease is for 17 cattle on approximately 3500 acres. Roughly 1500 acres of this allotment are within the Hunter Wash and Coyote leases. Associated with this allotment is a stockpond in T 24 N, R 12 W, Sec. 8 NE¼SW¼. Most years, water is available only in the springtime. Both water wells drilled in the area are now dry (see Water, above). The fence marking the eastern boundary of this allotment passes through the Hunter Wash lease. Both the Hunter Wash No. 3 and Gold No. 5 wells are east of this fence, on the grazing allotment of Thomas Pine (#5157), who has a year-long lease for 5 cattle on approximately 1100 acres. There are no range developments on this allotment within the project area. The Hunter Wash lease overlaps approximately 100 acres of this allotment.

Coal Resources

The Fruitland coal seams outcrop on the surface approximately four miles south of the project area. This exposure was mined seven miles to the southwest by Sunbelt Mining Company, a subsidiary of Public Service Company of New Mexico, during the mid-1980's. Under the Speerex leases, it is believed this deposit varies in thickness from 25 to 35 feet at depths of approximately 700 feet (in the northeast of the leases) to 475 feet (in the southwest). At these depths, coal mining is not commercially viable. For further discussion of the coal resources, see Oil & Gas Resources, below.

Oil & Gas Resources

Fruitland Formation

The Fruitland coal formation has the most potential for gas development within the Speerex leases. Well penetrations in and around the Speerex leases have provided sufficient data to determine the Fruitland coal reservoir is continuous under the Speerex leases. (See MAPS in Section IX.) Shallow depths (less than 950') lower the drilling and completion costs, encouraging oil and gas operators to drill and develop these low-volume producing coal gas wells.

In coalbed reservoirs, the natural gas is predominately stored as a molecularly absorbed phase within the coal. The gas storage capacity of a coalbed reservoir varies as a function of the reservoir temperature and pressure and the properties of the coal composition.

Coal thicknesses under the leases range from 27 to 33 feet (as extrapolated from known thickness of each well in the surrounding area). In addition to coal thickness, other parameters, such as ash content, presence or absence of cleating, presence of water or gas in the cleat system, formation pressure and stratigraphic changes which dominated coal deposition, affect the production performance of Fruitland coal gas wells. These parameters vary, both vertically and horizontally, in Fruitland coal reservoirs, accounting for the varied economic successes in Fruitland coal gas wells.

There are a number of characteristics that are typically displayed by wells that produce from the Fruitland coal in the San Juan Basin. Initially, wells produce large amounts of water, which decline over the life of the well. Conversely, gas production typically increases for a period of time, after which it declines similar to a conventional gas well. While these production characteristics are fairly typical of a coalbed gas well, there is some variation within the San Juan Basin. Some areas produce very little water and the gas production declines immediately as in a conventional gas well.

As well as having unique production characteristics, Fruitland coal wells produce a gas that differs from the gas produced out of a conventional gas reservoir. Gas produced from the Fruitland coal is typically characterized by high methane gas content and in some areas, high carbon dioxide content. Fruitland coal gas is considered dry to very dry because methane typically comprises 90% or more of the gas composition. Carbon dioxide content varies more than methane content throughout the San Juan Basin, ranging from a high of 10% in the overpressured north-central portion of the basin to less than 1% in the underpressured portion of the basin. The Speerex leases are located in the underpressured portion of the basin.

In addition to the Hunter Wash No. 1 well (discussed below), located in the NW¼SW¼ Sec. 4, T. 24 N., R. 12 W., there have been five Fruitland coal gas wells drilled within 1 mile of the Speerex leases. Each of these wells are individually discussed below.

> The Frank Foster No. 1, located in the SE¼SW¼ Sec. 32, T. 25 N., R. 12 W., was drilled and abandoned as an uneconomical coal gas well.
>
> The Frank Foster No. 2, located in the NE¼SE¼ Sec. 29, T. 25 N., R. 12 W., was drilled and abandoned because the operator mistakenly drilled the well in the wrong location.
>
> The No. 1 Bisti Coal 31 located in the SW¼NE¼ Sec. 31, T. 25 N., R. 12 W., began producing gas from the Fruitland coal in May 1993. Cumulative production is 27,147 thousand cubic feet of gas (MCFG) as of May 1, 1998. The well has averaged 15 thousand cubic feet per day (MCFD) over its producing life. The gas production has declined at 26% per year. Production in 1998 has averaged 11.6 MCFD through July.
>
> The Willow Flats No. 1 located in the NW¼SW¼, and Willow Flats No. 2 located in the NW¼NE¼, are both in Sec. 33, T. 25 N., R. 12 W, on lease NMNM-86493. In response to a BLM order, the lessee (Speerex) tested the Willow Flats No. 2 to demonstrate that the well and lease were capable of producing Fruitland coal gas in paying quantities. During the 24 hour test, Willow Flats No. 2 produced 11 MCFG and 14 barrels of water (BW). The BLM determined the volume to be uneconomic. Under appeal to the State Director, all parties agreed to a 180-day well test. During the first 6 month test period, production averaged 15 MCFD and 20 barrels of water per day (BWPD). An additional 180 day test period was then granted, and production again averaged 15 MCFD and 20 BWPD. In order to increase production, the Willow Flats No. 2 was re-perforated and acidized, 180 days of additional testing was granted. Production increased to a high of 36 MCFD and 75 BWPD. Subsequently, the gas production appeared to be very slowly increasing and the water production very slowly decreasing. Central Resources, Inc. was approved as the operator of Willow Flats No. 1 and No. 2 in February 1997, and continued to test the Willow Flats No. 2. The use of company-owned water trucks to haul off the produced Fruitland coal water -- and water disposal into a nearby, company-owned injection well -- have greatly reduced operational costs for this well. The test of the Willows Flats No. 2 was concluded August 31, 1998. On September 9, 1998, Central Resource's District Manager stated that despite their best attempts, the Willows Flats No. 2 was and would be uneconomic to produce. As such, Central Resources, Inc. proposed to plug and abandon both the Willow Flats No. 1 and No. 2. The sundry notices to plug both Willow Flats wells were approved September 11, 1998.

The Hunter Wash No. 1, located in the NW¼SW¼ Sec. 4, T. 24 N., R. 12 W., was tested by the

Federal Government for 180 days starting March 10, 1998. The test procedure consisted of running a sucker-rod pump below the perforations to remove the Fruitland Coal water so that gas could be desorbed from the coal. The Fruitland Coal water was then produced up the tubing so that any desorbed Fruitland Coal gas could flow up the casing annulus. The commingled water and gas were then separated via a two stage vertical separator. The produced water was stored in a tank for disposal while the produced gas was sent through a portable orifice-meter testing unit which continuously recorded static and differential pressure on a chart. The orifice-meter testing unit was set up with a 1/4" orifice plate. This small orifice plate was needed since the gas flow rates were so low, they would not record on the chart with a bigger orifice plate. The orifice-testing unit was also set up with a backpressure valve set at 20 psig. This backpressure was selected to mimic an extremely low pressure pipeline system. Due to motor problems, the pumpjack occasionally shut down, making it difficult to keep the water pumped off.

The test yielded results consistent with those results obtained from other wells in the immediate area. Specifically, during the 180 day test period, the Hunter Wash No. 1 produced 899 MCF of gas and 5,726 barrels of water (BW). This represents an average of approximately 5 MCFD and 32 BWPD. Water disposal costs were approximately $2.83 per barrel, for a total of $16,205. If the gas produced during the test had been sold at $2.00 per MCF (at or very slightly higher than reasonably realistic), total revenue would have been approximately $1,798. During the test, the Hunter Wash No. 1 was uneconomic to produce since the water disposal costs clearly exceeded any gas revenue that could have been realized. In addition, analysis of the gas shows it is comprised of approximately 92-93% methane, and 6-7% nitrogen. This high amount of nitrogen may increase costs of access to other companies' pipelines.

In summary, the test of the Hunter Wash No. 1 demonstrated that the produced daily gas volume was holding fairly constant while the produced water was slowly declining. However even after 180 days of dewatering the coal, large amounts of water were still being produced. The test was representative of the potential in the Fruitland Coal underlying the Speerex leases.

Gallup Formation

The Gallup oil and gas potential underlying the Speerex leases lies within thin, narrow, stacked sandstone bodies. Substantial Gallup development has aided in defining pool boundaries, both in geologic, as well as economic, terms throughout this area. (See MAPS in Section IX.)

The five proposed Gold Gallup well locations are staked along a narrow, linear Gallup sand trend which is approximately 10 feet thick. Two wells, the Mimms Carson No. 1 (NW¼ Section 4, T. 24 N., R. 12 W. -- now located on the Hunter Wash lease) and the Andy Williams No. 1 (SE¼ Section 31, T. 25 N., R. 12 W.) have penetrated and tested this narrow Gallup sandstone trend at depths of approximately 4,600 feet and 4,400 feet respectively. Both wells encountered sub-economic quantities of oil (less than 10 barrels of oil per day (BOPD)), and minimal amounts of water (less than 11 BWPD). The Mimms Carson No.1 was drilled in 1957 and was abandoned the following year after apparently producing only the same oil used to stimulate production of the well. The Andy Williams No. 1 well has produced a total of 1,937 barrels oil, 7,580 MCFG, and 4,200 BW since April, 1990. It is currently shut-in. Porosity values were low in both wells, resulting from the presence of clay minerals in the reservoir's pore spaces.

Because of the nature of the Gallup sandstone deposition and subsequent diagenesis (physical and chemical changes), it is common to have low porosity areas grade into high porosity areas along the sand trend. With continued drilling in a favorable economic setting, the discovery of additional Gallup sand trends is possible.

Cultural Resources

The project area lies in the San Juan Basin of northwest New Mexico, one of the most important archaeological areas in the United States. Within the San Juan Basin, there is a continuity of human occupation spanning over 10,000 years. The remains of Native Americans and Euro-Americans found in the San Juan Basin are diverse and include such things as simple hunting camp sites, rock art, trails, burials, pueblo villages and the so-called "great towns" of the Chaco culture, agricultural related features, game drives, quarries, sacred sites, trading posts, and ranches. In much of the San Juan Basin, including the region around the project area, the dominant culture is still Native American.

Most archaeological investigations in the vicinity of the project area have been a result of planned mineral exploration and development, though about 900 acres along the northern edge of Hunter Wash were surveyed for Block XI of the Navajo Indian Irrigation Project (Vogler *et al.*, 1982). A search of BLM survey records and the Museum of New Mexico’s Archaeological Records Management System site data base revealed 101 cultural components at 83 sites recorded in the vicinity of the project area prior to 1998: 1 Paleo-Indian component; 16 Archaic components; 3 Puebloan/Anasazi components, 29 Navajo components; and 52 components of unspecified age (though 50 of these were classified as prehistoric and 2 as historic). The single Paleo-Indian component is distinguished by a diagnostic projectile point found on what otherwise appears to be an Archaic site. Most of the Archaic sites are of unspecified age and are lithic scatters or quarries where siliceous stone was obtained for stone tool manufacturing. Many of the scatter sites, also characterized by the presence of fire-cracked rock and grinding stones, are located in sand dunes and represent other subsistence activities, such as the collection and processing of wild plant foods. The Puebloan remains are artifact scatters similar to the Archaic sites but with the addition of ceramics. Most of the Navajo material are 20th century, with only one site apparently from the pre-reservation period. The Navajo sites include sweat lodges, hogans, cairns, corrals, water control devices, graffiti, and campsites. The large number of unknown Native American sites are lithic scatters or quarries with no diagnostic material to indicate age or cultural affiliation. They could be almost any age, but are most likely Archaic or Puebloan.

The only archaeological surveys in the project area are those associated with the Speerex development proposals. Within the Speerex leases, three previous archaeological surveys are on record. The survey for the Hunter Wash No. 1 and associated access road (Hammack, 1991), the access routes and the locations of the Hunter Wash No. 2 and No. 3, and the Coyote No. 1 (Hammack, 1992a), and a well tie between the Hunter Wash No. 1 and the Willow Flats No. 1 (Hammack, 1992b), inspected 57 acres within the project area. At the beginning of 1998, the ARMS site data base listed three sites within the Speerex lease area (all of them in Section 4, T

24 N, R 12 W).

Between January and July, 1998, Moore Anthropological Research, Aztec, New Mexico, conducted an archaeological survey of the proposed Speerex locations and associated access routes, totalling approximately 157 acres (Moore, 1998). Nine newly documented archaeological sites, two previously documented sites, and 29 isolated occurrences of cultural material were identified at the well locations or along the proposed access routes. The sites are predominantly scatters of silicified stone debris left during the manufacture and maintenance of stone tools, ranging from a few artifacts to thousands. In some cases it appears that the materials were being quarried for their desirable flaking properties. At least two of the sites appear to be more permanent settings for subsistence activities. Most of the sites lacked chronologically distinctive artifacts, although more detailed analysis of artifact attributes has the potential to yield information that can be used to date the materials. It can reasonably be inferred that the undated remains are affiliated with either the Archaic or prehistoric Pueblo (Anasazi) cultures. It is not unreasonable to expect that some areas were utilized by both cultures. The isolates are predominantly isolated instances of silicified stone debris. A few examples of ceramics and ground stone were also documented. In addition, several paleontological specimens were noted.

Significance cannot be evaluated solely on the spectacular quality of a site or the numbers of artifacts that might be present(i.e., low numbers do not always equal insignificance; high numbers do not always equal significance). To most individuals, the sites on the Speerex leases are not spectacular or visually impressive. However, they have the potential to yield information regarding prehistoric stone trade, exploitation, and associated technologies, as well as adaptation and use of what might be viewed as an otherwise hostile environment. As such, it is likely they are eligible for the National Register of Historic Places as outlined in 36 CFR Part 60.4 under criteria (d). Given the very limited nature of the cultural isolates, none of those are considered eligible.

Some sites may have significance to Native Americans for other than their information potential. Sites may have significance to Native Americans as evidence of ancestral migrations, as places traditionally important for activities such as medicine gathering, or as locations associated with supernatural beings.

Very little ethnographic research (the study of a cultural heritage among living populations of people) has been completed in the area. At about the same time of the Bisti-Star Lake Project, the University of New Mexico was interviewing knowledgeable Navajo individuals in the area about the presence and locations of important traditional sites and local history. This research was prompted by land use planning associated with coal development. In the vicinity of the project area, only two locations were identified to the researchers. One location was reported as a source for *dleesh*, a white clay used ritually as paint and sometimes mixed with wolfberry as a food source. The second location was also identified as a source of *dleesh*, as well as a plant, *'azee libai béésh* (frankenia), used for birth control. Within ten miles of the project area, numerous locations were identified as burial sites, plant and mineral gathering areas, and ceremonial sites.

There may be additional places of importance to Native Americans within the project area. Some of these, as evidenced by York and Winter (1988) are not usually identifiable by traditional archaeological surveys. Though none have been formally identified in the project area, in his comments at the Farmington scoping meeting (February 24, 1998) Thomas Pine referred to the area with its own, distinct name: *Ńdĩshchĩĩ* (pine tree).

Paleontology

The project area consists of the pre-Naashoibito portion of the Kirtland Formation. Along with the adjacent Fruitland formation, these strata have yielded the largest and most diverse vertebrate faunas from the Upper Cretaceous in the southern Rocky Mountains. The stratigraphic units in the project area have been critical to studies (Lucas *et al.*, 1987) of the Cretaceous/Tertiary boundary -- the end of the Age of Dinosaurs and the beginning of the Age of Mammals.

Flora of the Kirtland Formation below the Naashoibito Member is represented by over thirty-five species in more than twenty families from primitive classes to flowering plants. According to Hunt and Lucas (1992), plant megafossils become increasingly rare up section through the Fruitland and Kirtland Formations. However, during the paleontological reconnaissance survey for the Proposed Action (O'Neill, 1998), the Hunter Wash Member exhibited a high occurrence of fossil wood. These occurred as both isolated scatters and in-situ logs and stumps. Until recently, no detailed studies of the floras of the Fruitland and Kirtland Formations have been made. Starting in 1996, detailed collection and study has been conducted by researchers at the Smithsonian and University of Nebraska. Preliminary findings indicate 1) that there was minor transport at most sites and that assemblages represent the local flora, 2) ferns were dominant in both abundance and diversity in ash-falls found within coal beds, 3) swamps with sediment influx from periodic flooding were dominated by dicots, 4) floras found within siltstone over large coal beds were dominated by dicots and conifers and 5) dicots were dominant in all areas of the flood plain, except for distal swamps. Contrary to the statement made by Hunt and Lucas (1992) that palms are only present in the Fruitland Formation, palmwood was commonly seen in the Farmington and Hunter Wash Members during this survey.

Invertebrates such as unionid bivalves and nonmarine gastropods, although common in the Fruitland, are fairly rare in the pre-Naashoibito portion of the Kirtland Formation. To date, fewer than five species have been identified. In the Hunter Wash Member, unionids and gastropods are mainly restricted to channel-lag accumulations. During the paleontological reconnaissance survey for the Proposed Action, a walnut-size stone from a reworked conglomerate was noted to have an impression of a small brachiopod. Impressions of brachiopods and bryzoans are commonly found in the pebble conglomerate of the upper Kirtland Formation.

The Kirtland Formation below the Naashoibito Member (De-na-zin, Farmington, Hunter Wash and Bisti Members) produces a vertebrate fossil assemblage nearly as diverse as, and of similar composition to, that of the Fruitland Formation (Hunt & Lucas, 1992). The stratigraphic interval over which these fossils occur is very thick, as much as 550 meters (Lucas, 1981). The vertebrate faunas of the Fruitland and Kirtland Formations represent the largest and most diverse Late Cretaceous faunas of the southwestern interior and are the subject of a century-long history of collection and study (Hunt *et al.*, 1992).

The vertebrate fauna of the Kirtland Formation below the Naashoibito Member many species of turtles, crocodiles, and fish, as well as outstanding examples of more "glamorous" dinosaurs, such as Pentaceratops, Parasaurolophus, and Albertosaurus. In addition, remains of some of the earliest mammals have been found. In all, the strata found in the project area have yielded the remains of over thirty vertebrate species. A recent compilation of the taxonomy of fossil life in the project area can be found in O'Neill (1998).

The most comprehensive paleontological survey of the vicinity of the project was conducted over twenty years ago by Kues *et al.* (1977). A survey of the well locations proposed by Speerex was made by the BLM as part of this EIS (O'Neill, 1998). Four wells were staked in the De-na-zin Member of the Kirtland Formation. Fossil wood is common and included in-situ logs and stumps. However, preservation of the logs and stumps was poor because of weathering and fracturing. Also noted were isolated surface scatters of fossil bone, highly fragmented and not diagnostic.

Four wells were staked in the Farmington Member of the Kirtland Formation. Isolated surface occurrences of highly fragmented fossil bone appearing to be dinosaurian in origin were found. The bone fragments were not taxonomically diagnostic. The nature of these occurrences and the condition of the material (fragmented and badly abraded) suggests that it could have been transported from the more fossiliferous exposures of the De-na-zin or Naashoibito Members of the Kirtland Formation.

Five wells are staked in the Hunter Wash Member. Fossil wood including in-situ stumps and logs were more prevalent than fossil bone. However, several occurrences of fossil bone were noted that contained diagnostic skeletal elements such as partial dinosaur limbs and some well-preserved toe bones.

Although it appeared that surface fossil material was not abundant in the project area, there is sufficient evidence to suggest the potential for more complete and diagnostic material within the exposures of all the members of the Kirtland Formation. These strata are known for important paleontological resources, and surface reconnaissance does not necessarily indicate comprehensive accounting of sub-surface occurrences. In addition, the high rate of erosion and the nature of the slope and stratigraphy, combined with the effects of weather, could affect how the surface occurrences are interpreted. The depositional composition and character of the De-na-zin, Farmington, and Hunter Wash Members of the Kirtland Formation are highly vulnerable to the agents of erosion, thus making interpretation and analysis of the fossils complicated and difficult.

Recreation

The eroding badlands that dominate the project area in the B/DNZ provide an opportunity for unusual types of primitive and unconfined hiking, backpacking, photography, and geological/paleontological sightseeing.

With the use of trail counters, the current annual visitation to the B/DNZ is estimated at approximately 10,000 people. Few of these make it to the project area. The Bisti guest register has been signed by visitors from all over the United States and many parts of the world: forty-five percent of those registering are from more than a ten-hour's drive away.

Wilderness

The B/DNZ offers outstanding opportunities for primitive and unconfined recreational pursuits such as hiking, backpacking, and horseback riding. The strange geological formations are a delight to amateur and professional photographers alike, and even the casual observer is easily struck by these works of erosional art. Though relatively small, the B/DNZ -- without trails and without water -- offers a moderate degree of challenge for the recreationist.

The opportunity for solitude is outstanding. This, too, is a function of the lack of water and trails -- the first keeps the number of visitors venturing far into the wilderness low, and the second disperses those that do penetrate the interior. Appreciation for the serene silence that greets the visitor is one of the most frequent comments in the visitor register. The B/DNZ is the only designated wilderness within the San Juan Basin

The B/DNZ has value as both an environmental baseline and a scientific resource in its own right. In addition to the scientific values detailed above, the B/DNZ may also serve as a laboratory in which to study the bio-physical system that once was common in the northwestern New Mexico and northeastern Arizona region, but has been increasingly modified by human action. This area is a grama-galleta grassland ecotype (Davis, 1987), only one of two examples of this ecotype protected as wilderness (the other being the Petrified Forest Wilderness in Petrified Forest National Park, Arizona).

For many people, wildernesses have values beyond what can be directly experienced or scientifically measured. In a rapidly changing world, the National Wilderness Preservation System symbolizes the ability of Americans to place self-imposed limits on our technology -- to say, in effect, that we choose not to alter or subjugate all the earth to our economic gain simply because we can. The battle prior to designation over the coal resources in the Bisti Wilderness exemplifies this principle for many citizens. Even the mere existence of wildernesses has value to some people who may never visit them.

Visual Resources

The project lands are visually dominated by a strong sense of openness punctuated by rugged outcrops and finely textured rolling badlands; multitudinous hues range from reds and pale greens though all shades of brown to black. These lands are in a designated Visual Resource Inventory Class I area. This class is assigned to all special areas where management requires maintaining a natural environment essentially unaltered by humans. The objective of this class is to preserve the existing character of the landscape. The class provides for natural ecological changes. It does not preclude very limited management activity; however, the level of change to the characteristic landscape should be very low and must not attract attention.

IV. ENVIRONMENTAL CONSEQUENCES

Introduction

For the three alternatives (described in Chapter II of this EIS) analyzed below, effects to each of the resources are discussed. Measures that would be taken to mitigate the effects to each is discussed under that resource, and then repeated in aggregate for all resources at the end of the section for each alternative action.

Impacts are considered to be either short-term (lasting the duration of drilling -- 1 to 3 years), long-term (lasting the duration of well production -- 20 to 30 years), or permanent. Cumulative impacts are addressed in a separate subsection for each alternative, and are assessed on the scale of the entire San Juan Basin.

Proposed Action

Topography & Soils

The Proposed Action would result in the displacement and mixing of approximately 50,303 cubic yards of soil along the entire length of the access roads and well pads. [See TABLES in Part IX]. Soils displaced by the road construction on steep slopes would be moved to fill in low areas and in the construction of erosion control features. This would result in long-term alterations to the topography of the project area. These alterations would include the moving and mixing of soils to achieve a slope/grade to enable the access of company vehicles and equipment to the proposed locations. Slopes along the proposed access routes are usually relatively flat, but some portions have slopes in the 10%-15% range and two short sections are in the 25% to 40% range. Changes in topographic relief would vary in extent and would be noticeable. Recontouring has the potential to alter drainage patterns. Crossing ephemeral washes would require excavation within the wash bottom to allow the installation of culverts to allow traffic and equipment through without obstructing runoff flow during inclement weather. Approximately 43 acres of soil would be exposed and compacted as a result of clearing the proposed routes for the access roads and well locations. An undetermined amount of soil erosion by both wind and water would continue until revegetation efforts succeed where possible. Despite the implementation of mitigation measures, impacts to the project area topography and soils would be moderate to high, and long-term, remaining until the abandonment of the well(s). The moving and mixing of soils on hills and wash areas would result in some permanent modifications to the topography.

MITIGATIVE MEASURES

All efforts would be made to keep surface disturbance to a minimum (e.g., in areas where the ground is level enough to set up equipment without leveling, pads smaller than 150' x 150' would be used where still safe.) Self-contained tanks (portable pits) would be required for all drilling procedures and production operations. It is expected that these practices would reduce soil disturbance from the well pads by approximately 14,158 cubic yards to approximately 5,390 cubic yards. [This also mitigates effects under Water, Vegetation, Livestock Grazing, Paleontology, and Visual Resources.]

All pipelines would be laid on the surface, except in the five locations where they must be buried for access crossings. This would reduce soil disturbance from the pipelines by approximately 19.6 acres and 11,775 cubic yards to approximately 23.4 acres and 165 cubic yards. [This also mitigates effects under Water, Vegetation, Livestock Grazing, and Paleontology.]

The construction of access roads would be kept to a minimum (while still safe for drilling rigs) until the well is deemed economical. A route twenty feet wide would be marked with lath to keep traffic within the proposed access route, and access would be limited to times when the soil is either dry or frozen. Blading would be allowed only where necessary, and as much of the route as possible would be left unbladed. Only when the well is completed and determined to be economical to produce, would the access road to the well be up-graded to sustain the weight and amount of year-round traffic. This up-grade would be to the requirements requested by the BLM, including:

road design by a certified engineer in segments where the slope of the proposed road is greater than ten percent (10%);

surface material such as crushed clinker (red dog) applied wherever soils would be damaged by repeated, heavy traffic (all surfacing material would be removed at the end of the life of the well(s) accessed by that route); and

coordinating the placement of culverts with authorized officer.

[This also mitigates effects under Vegetation, Paleontology, and Visual Resources.]

The road would be maintained so that user traffic remains within the right-of-way and erosion is minimized. Maintenance may include drainage dips, turnout ditches, crowning and/or out-sloping/in-sloping, and low water crossings.

Should the well(s) prove to be economical to produce, areas disturbed but not needed for production equipment facilities would be recontoured and reseeded with a customized seed mixture of naturally occurring plant species within the area. At the end of the life of the well(s) -- or if the well(s) proves to not be economical to produce -- all equipment, including road surfacing materials and culverts, would be removed and the well location and access road would be ripped (to alleviate soils compaction), recontoured, and seeded with a seed mixture of naturally occurring plant species within the area. In areas where there was very little to no vegetation prior to disturbance, Speerex Ltd would not seed. [This also mitigates effects under Air Quality, Wildlife, and Visual Resources.]

Taken together, the mitigative measures reduce surface compaction on approximately 19.6 acres; they reduce subsurface disturbance by approximately 25.933 cubic yards. It is estimated that, after mitigation, surface disturbance would be approximately 23.4 acres and subsurface disturbance approximately 24,370 cubic yards.

Air Quality

Air quality would be impacted during the construction, drilling, completion, and production phases of the proposed wells. Traffic from trucks and heavy equipment during the construction and drilling phase would raise the dust and emission levels in the area. This increase would be short-term.

A variety of low, long-term impacts to air quality can be expected under this alternative. If the wells are put into production, company personnel can be expected to inspect and service the wells several times per week. Once the wells start producing, low levels of criteria pollutants would be emitted into the atmosphere from the equipment placed on the locations. This would occur over the life of the wells. It is anticipated that the equipment used to produce the wells would be similar to that used elsewhere in the San Juan Basin, and it is assumed that the estimated emission rates for equipment used by Speerex would also be similar (see Price, 1998). Consequently, it is anticipated that Speerex would not be required to obtain permits from the NMED/AQB for most of the equipment used in the production of their wells. The exception might be in the use of portable compressor units. Various odors would also be produced at the locations during the construction, drilling, completion, and production phases. These may include diesel fumes and chemical odors associated with construction, drilling and completion operations, or odors associated with the production of hydrocarbons once the wells start producing.

Where existing vegetation is removed for the construction of the well pads and access roads there would be an increase in the amount particulate matter that enters into the ambient air. This would be especially noticeable on windy days for those places that were constructed in highly sandy soils.

There are no permanent impacts to air quality under this alternative.

MITIGATIVE MEASURES

Reestablished vegetation would help hold the soil in place and cut down on the particulates in the air, so any parts of the pad not used for production would be seeded using custom, native seed mixtures. [This also mitigates effects under Topography & Soils and Wildlife.]

Due to the possibility that compressor units may require a NOI or streamline permit, the BLM would require Speerex to submit a copy of any necessary documentation showing that any compressor used in the project area is in compliance with state and federal air regulations. Documentation may include a copy of the NOI or streamline permit, as approved by the New Mexico Environment Department Air Quality Bureau. It would be the responsibility of the operator to ensure that all equipment used for the drilling and production of all wells within the project area complies with all federal, state, and local air regulation guidelines.

Suspended dust from the traffic during construction and drilling would be reduced by the operator sprinkling the roads with fresh water from a permitted source.

Noise

Any unnatural increase in the noise levels would lessen the opportunity for solitude and diminish the wilderness experience for many visitors. An increase in noise levels may also have a negative effect on wildlife present. While large populations of big game are not found within the vicinity of the project area, various species of raptors are. Loud noise generated around the nesting sites of raptors found in the vicinity may have a negative effect on the birds.

There would be a short-term increase in the noise level at each location during the construction, drilling and completion phase of the well and the installation of the pipeline. If the wells are put into production, noise would be generated by truck traffic into the locations and the operation of equipment used to produce the wells. Noise may be generated intermittently by the firing of separators or dehydrators, or the emptying of liquids into a tank or pit. The use of pumpjacks or compressors on location would produce a loud, constant noise when in operation. Even at a distance of over 2 miles, pumpjacks may be audible without appreciably adding to the decibel level. Taken together, these components of the Proposed Action would create long-term noise impacts, audible throughout the project area.

MITIGATIVE MEASURES

Mufflers (or other sound baffling equipment) of sufficient quality to not increase ambient noise at a distance of ⅔ mile would be required at each location on all motors used after the well is drilled. With this mitigation, impacts would remain long-term, but moderate to low. [This also mitigates effects under Wildlife and Recreation.]

Water

The Proposed Action would remove vegetation from approximately 32.9 acres of land. This exposure, particularly in wash areas, would lead to an increase in an undetermined amount of sediment transport, particularly during and following storm events. Alterations in project area drainage patterns, resulting from topographic changes, would likely lead to an increase in sediment transport. These increases in sediment transport are long-term; due to the soil types and the minimal vegetative cover that exist, the increases are expected to be minor when compared to the baseline erosional patterns in the project area. Well sites Coyote No. 3 and Barns No. 3 are at risk of flooding from an extreme rainfall in the upper Hunter Wash drainage. Any material in an open pit would be washed into the arroyo, contaminating the soil downstream.

MITIGATIVE MEASURES

As mitigated above (Topography & Soils), would expose approximately 17.4 acres of land as a sediment source. See also requirement for self-contained pits detailed under Topography & Soils, above. The tanks used during both the drilling and production phases of the wells within the Special Flood Hazard Area (Coyote No. 3 and Barns No. 3) would be required to be made of material that will neither float nor tip in water.

Vegetation

The Proposed Action includes building approximately 6.8 miles of new access and 8.2 miles of pipeline to the proposed well locations. The access routes would have a 14-foot wide driving surface. However, the construction corridor for these routes would be 20 feet wide and it must be anticipated that vegetation would be lost across the entire width of the corridor. The pipeline right-of-way would be an additional 20 feet wide. The thirteen well pads would be 150' x 150' each. The total surface impact would be approximately 43 acres. [See TABLES in Part VIII]. Much of the area is largely unvegetated, including three of the well pads and approximately 1.8 miles of both access and pipeline. Vegetation would be removed for the long-term on a total of approximately 32.9 acres. This would include the loss of individuals of *Asclepias sanjuanensis*, and may include losses of *Erigeron bistiensis* and *Proatriplex pleiantha*. In addition, access by oilfield vehicles has increased the spread of invasive weeds throughout the San Juan Basin, and increased access in the project area by the Proposed Action would create a similar threat here.

MITIGATIVE MEASURES

See mitigation under Topography & Soils, above. Among other effects, these measures would reduce the area of long-term loss of vegetation by over 15 acres to approximately 17.4 acres.

Reclamation would include seeding each location with a mixture of native plant species occurring in the area and capable of surviving the arid climate of the region. If the area is not satisfactorily re-established in native plants within two growing seasons, BLM may require reseeding by Speerex. [This also mitigates effects under Wildlife.]

Speerex would be responsible for surveying wellpads and access routes for the presence of *Erigeron bistiensis* and *Proatriplex pleiantha*. If *E. bistiensis* is found, access routes and well pads would be moved to avoid plants. If *P. pleiantha* is found, access routes and well pads would be moved to avoid plants only if the New Mexico Rare Plant Technical Council declares it a Species of Concern prior to the effective date of the Record of Decision on this EIS. In the absence of a U.S. Fish & Wildlife Service determination on the status of *Asclepias sanjuanensis*, no special mitigative measures would be undertaken to protect this species.

Speerex would be responsible for the selective control of invasive weeds on disturbed and reclaimed areas accessed by equipment associated with the development and production of their wells. Speerex would be required to consult with FFO for acceptable weed control methods prior to undertaking any action.

Wildlife

During construction activities there would be moderate, short-term impacts to area wildlife as a result of human and vehicular activity, and the associated noise. Some burrowing animals may be killed or their burrows destroyed during construction activities. Wildlife would be temporarily displaced by these activities, though would likely return to the area once construction activities are completed. Frequent access to well pads throughout the life of the wells would create a long-term disturbance to especially sensitive species, such as the ferruginous hawk.

MITIGATIVE MEASURES

Noise mitigation (see above) would help reduce any negative effects incurred by wildlife in the area.

Minimizing areas disturbed (see mitigation for Topography & Soils, Air Quality, and Vegetation, above) would help reduce long-term impacts to wildlife. Permanent impacts to wildlife caused by the removal of vegetation and the moving and pushing of soils to make a level area for a well pad would be mitigated by recontouring the area and seeding the area with a seed mix of naturally-occurring species.

Drilling wells, or the construction of routes or well pads, would be prohibited during raptor nesting season (March 15 to July 15) if within ⅓ mile of a ferruginous hawk, golden eagle, or prairie falcon nest.

Livestock Grazing

Developing oil and gas leases would occur simultaneously with the grazing of livestock within the project area. The construction of the access routes, pipelines, and well pads would result in the removal of vegetation. As mitigated above (see Vegetation), this long-term loss would total approximately 18 acres -- too small an amount to suffer the loss of any Animal Unit Months. There is the possibility of livestock mortality within the project area due to increase in vehicle activity or produced fluids from a leak or spill being ingested by livestock. In addition, the new routes might provide vehicle access for theft of livestock in this remote area.

MITIGATIVE MEASURES

Replacing pits with self-contained tanks (see Topography & Soils, above) would reduce the likelihood of livestock (or any wildlife) from consuming produced fluids. In addition, storing any hazardous or harmful fluids on location would be prohibited.

Prior to the development of access routes, Speerex would fence and gate the wilderness boundary in such a way as to prevent vehicle trespass, thus reducing the likelihood of livestock theft. [This also mitigates effects under Cultural Resources and Paleontology.]

Coal Resources

There would be no effect on Coal Resources under this alternative.

Oil & Gas Resources

Under this alternative, an unknown quantity of hydrocarbons might be recovered. If production occurred in economical quantities, the United States would receive a corresponding, but likewise unknown, amount of royalty payment.

Cultural Resources

It is believed that all of the sites found on the Speerex leases are eligible for the National Register of Historic Places because of their potential to yield information important in prehistory. Several of these sites are at risk under the Proposed Action, but could be greatly reduced through mitigation. The potential for subsurface cultural resource discoveries during construction is considered low.

MITIGATIVE MEASURES

To avoid sites and preserve their physical integrity, three wellpads and associated access routes would be moved. Speerex would have its contracted archaeologist temporarily fence sites prior to construction and monitor sites during construction. In the event a subsurface cultural resource is discovered during construction, construction operations in the vicinity of the discovery would be halted and the discovery reported to the FFO Manager. BLM would then specify what action is to be taken. FFO standard Cultural Resource Conditions of Approval #1, #2, #3, and #4 would apply (see APPENDIX D).

Speerex would conduct a pre-construction meeting with its employees, sub-contractors, and/or sub-contractors' employees, at which time it would be explained that no cultural or paleontological material of any kind is to be removed from the project area or adjacent lands. Speerex would be responsible for enforcing this condition of approval for the life of the wells.

Locked gates on the access ROW (see mitigation for Livestock Grazing, above) would decrease the likelihood of the theft of archaeological specimens by the general public.

Paleontology

The proposed routes of access and the proposed well pads are all located on or through exposures of the Kirtland Formation. And, although the fossils noted during the on-site survey were not classified as important finds, these are major fossil-bearing exposures and the potential for destruction and permanent loss of important paleontological resources is high. In addition, the nature of the Proposed Action would, in effect, have a direct impact on fossils contained in lower, sub-surface strata such as the Bisti Member of the Kirtland Formation, and the Fruitland Formation, which are documented to be highly fossiliferous.

Increased vehicular access to areas of high paleontological value increase the likelihood of the theft of these resources. Indeed, fossilized material was taken during the onsite inspections in February, 1998.

MITIGATIVE MEASURES

Consistent with standard BLM procedures for activities in any area of known high paleontological values (and analogous to procedures for activities in known areas of concentrated archaeology), Speerex would be required to have a qualified consulting paleontologist on site during any surface-disturbing construction (e.g., blading roads or wellpads) in fossil-producing exposures. (The permitting qualifications for such a paleontologist are the same as those required for a Paleontological Resource Use Permit in the BLM, and any proposed on-site consultant would be approved in advance by the BLM Regional Paleontologist.) The consulting paleontologist would stop construction upon finding any paleontological remains, and determine the significance of the find in consultation with the BLM Regional Paleontologist. Any significant find would cause construction to be suspended while the specimen is collected in such a manner as to preserve as much of it as possible; any significant find would be curated in an approved repository. The costs of excavation and curation would be borne by Speerex.

To reduce the impacts caused by the excavation of drilling pits, all well pad pits would be replaced by self-contained tanks. Surface pipelines would decrease the impacts to paleontology associated with this part of oilfield development. See the measures listed under Topography & Soils, above.

Locked gates on the access ROW (see mitigation for Livestock Grazing, above) would decrease the likelihood of the theft of paleontological specimens by the general public. See also the measures listed under Cultural Resources, above.

Recreation

Hiking, backpacking, photography, and geological/paleontological sightseeing could continue under the Proposed Action. During drilling, however, recreation would decrease by visitors who desire quiet solitude. This short-term loss would occur over several thousand acres in the vicinity of the project area due to the presence of, and noise generated by, drilling equipment. Long term losses would occur on slightly less land -- perhaps a few thousand acres -- because less noise is associated with producing wells as compared with drilling them. There would be no permanent impacts to recreation.

MITIGATIVE MEASURES

The only measures that might be taken to mitigate impacts to recreation can be found under Noise, above, or Visual Resources, below.

Wilderness Values

Roads, well pads, and pipelines would destroy portions of the wilderness resource in the long term, and scientific values of wilderness are threatened by the Proposed Action. For detailed description, see the sections on Topography & Soils, Air Quality, Water, Vegetation, Wildlife, Cultural Resources, and Paleontology, above. In addition, the environmental baseline of a relatively undisturbed grama-galleta grassland will be jeopardized in the project area.

The constant mechanical noise and vehicular activity during drilling, will destroy the sense of naturalness and the wilderness experience for the short-term on the lands of the Speerex leases and adjacent portions of the B/DNZ. Test data from the Hunter Wash No. 1 well indicates that a water truck could be expected to service each of the Fruitland wells every other day. Oil (and water, if necessary) would be trucked from each of the producing Gallup wells, though it can not be forecast at this time how frequent those trips would be. In addition, well-head pumping units would add to the mechanical intrusions. These impacts, when coupled with the existence of roads and pipelines, are expected to destroy the wilderness experience on the Speerex leases and adjacent portions of the B/DNZ in the long term. There would be no permanent loss of wilderness experience.

Impacts to symbolic and spiritual values of wilderness are highly individualized. For most Americans, there would be no loss of these values of the B/DNZ even during the short-term; for some, the impacts of the intrusion of human technology into a designated wilderness may be permanent.

MITIGATIVE MEASURES

There would be no mitigative measures.

Visual Resources

The Proposed Action would cause a long-term impact to the area's visual resources. This impact exceeds VRM Class I standards. The impact would be increased by certain mitigative measures prescribed to minimize undesirable impacts to other resources (e.g., using surface pipelines). Impairment would be lessened, though not totally mitigated, by the following actions.

MITIGATIVE MEASURES

All tanks would be low profile (maximum height: 10 feet).

All well-pad structures and equipment, as well as all surface pipelines, would be painted to BLM specifications dependant upon background terrain. The use of multiple colors on one piece of equipment, as well as periodic re-painting or touch-up, may be required.

Upon abandonment of the well, all pipelines (surface and buried), all well-pad equipment, and any surfacing material applied to access routes would be removed. The plugged wellbore would be cut off at least six feet below the surface.

See also the mitigation under Topography & Soils.

Environmental Justice

Executive Order #12898 requires Federal agencies to analyze the effects of proposals on minority or low-income communities and to avoid making decisions that discriminate against them. While several Navajo adjacent landowners spoke against the Proposed Action at the Farmington scoping meeting in February 1998, the proposal cannot be said to discriminate against them.

Economic Impacts

The Proposed Action would create the possibility for Speerex to create a profit on its investment and return a royalty payment to the United States. Drilling and production of these wells would create employment opportunities for oilfield workers. However, especially in light of production tests and records from the Hunter Wash No.1 and other nearby wells, it is by no means certain that this possibility would come to pass.

It is possible that publicity surrounding the approved Proposed Action would lead to a decrease in visitation to the B/DNZ, which would have a negative economic impact on Farmington and other surrounding communities. The impact could vary from short- to long-term, but the former is more likely. It is expected that this impact, if realized at all, would be very slight.

MITIGATIVE MEASURES

There would be no mitigative measures.

Cumulative Impacts

It is expected that the Proposed Action would have no certain cumulative impact on any resource other than wilderness. The B/DNZ is the only place entirely within the San Juan Basin where wilderness values are protected. The Proposed Action's impacts to wilderness, described above, would create a cumulative impact to this resource. In addition, depending on the success of mitigative measures, there may be cumulative impacts to plant or animal species of special concern, or paleontological resources.

Irreversible and Irretrievable Commitment of Resources

The only irreversible and irretrievable commitment of resources in the Proposed Action are the removal of oil and gas resources and some permanent modifications to the topography.

Mitigative Measures

In order that the BLM may monitor the Proposed Action, Speerex would be required to contact the FFO at least 48 hours prior to any drilling or construction. In addition, the following is a reiteration of the conditions of approval proposed from each of the resources discussed above:

1. Speerex would conduct a pre-construction meeting with its employees, sub-contractors, and/or sub-contractors' employees, at which time it would be explained that no cultural or paleontological material of any kind is to be removed from project area or adjacent lands. Speerex would be responsible for enforcing this stipulation for the life of the wells.

2. Prior to the development of access routes, Speerex would fence and gate the wilderness boundary in such a way as to prevent vehicle trespass.

3. All efforts would be made to keep surface disturbance to a minimum (e.g., in areas where the ground is level enough to set up equipment without leveling, pads smaller than 150' x 150' would be used where still safe.)

4. Speerex would be responsible for surveying wellpads and access routes for the presence of *Erigeron bistiensis* and *Proatriplex pleiantha.* If *E. bistiensis* is found, access routes and well pads would be moved to avoid plants. If *P. pleiantha* is found, access routes and well pads would be moved to avoid plants only if the New Mexico Rare Plant Technical Council declares it a Species of Concern prior to the effective date of the Record of Decision on this EIS.

5. Drilling wells, or the construction of routes or well pads, would be prohibited during raptor nesting season (March 15 to July 15) if within ⅓ mile of a ferruginous hawk, golden eagle, or prairie falcon nest.

6. To avoid archaeological sites and preserve their physical integrity, three wellpads and associated access routes would be moved. Speerex would have its contracted archaeologist temporarily fence sites prior to construction and monitor sites during construction. In the event a subsurface cultural resource is discovered during construction, construction operations in the vicinity of the discovery would be halted and the discovery reported to the FFO Manager. BLM would then specify what action is to be taken. FFO standard Cultural Resource Conditions of Approval #1, #2, #3, and #4 would apply (see APPENDIX D).

7. During any surface-disturbing construction (e.g., blading roads or wellpads) in fossil-producing exposures, Speerex would be required to have a qualified consulting paleontologist on site. (The permitting qualifications for such a paleontologist are the same as those required for a Paleontological Resource Use Permit in the BLM, and any proposed on-site

consultant would be approved in advance by the BLM Regional Paleontologist.) The consulting paleontologist would stop construction upon finding any paleontological remains, and determine the significance of the find in consultation with the BLM Regional Paleontologist. Any significant find would cause construction to be suspended while the specimen is collected in such a manner as to preserve as much of it as possible; any significant find would be curated in an approved repository. The costs of excavation and curation would be borne by Speerex.

8. The construction of access roads would be kept to a minimum (while still safe for drilling rigs) until the well is deemed economical. A route twenty feet wide would be marked with lath to keep traffic within the proposed access route, and access would be limited to times when the soil is either dry or frozen. Blading would be allowed only where necessary, and as much of the route as possible would be left unbladed. Only when the well is completed and determined to be economical to produce, would the access road to the well be up-graded to sustain the weight and amount of year-round traffic. This up-grade would be to the requirements requested by the BLM, including:

road design by a certified engineer in segments where the slope of the proposed road is greater than ten percent (10%);
surface material such as crushed clinker (red dog) applied wherever soils would be damaged by repeated, heavy traffic (all surfacing material would be removed at the end of the life of the well(s) accessed by that route); and
coordinating the placement of culverts with authorized officer.

9. The road would be maintained so that user traffic remains within the right-of-way and erosion is minimized. Maintenance may include drainage dips, turnout ditches, crowning and/or out-sloping/in-sloping, and low water crossings.

10. Suspended dust from the traffic during construction and drilling would be reduced by the operator sprinkling roads with fresh water from a permitted source.

11. Self-contained tanks (portable pits) would be required for all drilling procedures and production operations. The tanks used during both the drilling and production phases of the wells within the Special Flood Hazard Area (Coyote No. 3 and Barns No. 3) would be required to be made of material that will neither float nor tip in water.

12. All pipelines would be laid on the surface, except in the five locations where they must be buried for access crossings.

13. Mufflers (or other sound baffling equipment) of sufficient quality to not increase ambient noise at a distance of ⅔ mile would be required at each location on all motors used after the well is drilled.

14. The operator would be required to submit a copy of any necessary documentation showing that any compressor used in the project area is in compliance with state and federal air regulations. Documentation may include a copy of the NOI or streamline permit, as approved by

the New Mexico Environment Department Air Quality Bureau. It would be the responsibility of the operator to ensure that all equipment used for the drilling and production of all wells within the project area complies with all federal, state, and local air regulation guidelines.

15. Storing any hazardous or harmful fluids on location would be prohibited.

16. All tanks would be low profile (maximum height: 10 feet).

17. All well-pad structures and equipment, as well as all surface pipelines, would be painted to BLM specifications dependant upon background terrain. The use of multiple colors on one piece of equipment, as well as periodic re-painting or touch-up, may be required.

18. Areas disturbed but not needed for production equipment facilities would be recontoured and seeded with a custom seed mixture of plant species naturally occurring within the area. At the end of the life of the well(s) -- or if the well(s) proves to not be economical to produce -- all equipment, including road surfacing materials and culverts, would be removed and the well location and access road would be ripped (to alleviate soils compaction), recontoured, and seeded as above. If the area is not satisfactorily re-established in native plants within two growing seasons, BLM may require reseeding by Speerex. In areas where there was very little to no vegetation prior to disturbance, Speerex Ltd would not reseed.

19. Speerex would be responsible for the selective control of invasive weeds on disturbed and reclaimed areas accessed by equipment associated with the development and production of their wells. Speerex would be required to consult with FFO for acceptable weed control methods prior to undertaking any action.

20. Upon abandonment of the well, all pipelines (surface and buried), all well-pad equipment, and any surfacing material applied to access routes would be removed. The plugged wellbore would be cut off at least six feet below the surface.

"No Action" Alternative (Denial)

The "No Action" Alternative would create no new impacts to Topography & Soils, Air Quality, Noise, Water, Vegetation, Wildlife, Livestock Grazing, Coal Resources, Cultural Resources, Paleontology, Recreation, Wilderness Values, Visual Resources, Environmental Justice, nor would there be any irreversible and irretrievable commitment of resources.

Oil & Gas Resources

Under this alternative, no hydrocarbons would be recovered at this time, though Speerex could still try to produce the Hunter Wash No. 1 well. Any such hydrocarbons would remain unavailable for energy production and consumption by the public.

Economic Impacts

Under this alternative, Speerex would not have the opportunity to create a profit on its investment from other than the Hunter Wash No. 1 well, and the Federal government would receive no royalty payment. Denying drilling and production of these wells would mean no additional employment opportunities would be created for oilfield workers. However, in light of production tests and records from the Hunter Wash No.1 and other nearby wells, it is by no means certain that these economic benefits would be realized if the no action alternative were to be rejected.

Cumulative Impacts

Given the extent of oil and gas production in the San Juan Basin, there would be no change in cumulative impacts to oil and gas resources from choosing this alternative. There would be no cumulative impact on any other resource.

Mitigative Measures

No mitigative measures are necessary.

Alternative A: approve APD's but deny ROW's

The issuance of a Federal oil and gas lease carries with it neither an expressed or an implied right of access to the leasehold. There is, however, adequate (and less environmentally damaging) access to the leases across land either outside the wilderness or whose surface is not regulated by FLPMA. Two abandoned primitive vehicle ways approach the Coyote No. 3 well from outside the wilderness. These join on Navajo Tribal Trust lands currently administered by the Bureau of Indian Affairs, entering Federal surface approximately 220 feet northwest of the Coyote No. 3 well, as shown on the map "Alternative A" in Section X. One route, though more recently driven, travels a greater distance in badland soils and showed greater evidence of both paleontological and cultural resource material. However, route selection past the lease boundary could vary greatly, is not under the control of BLM, and therefore is not analyzed in this EIS. All the proposed wells on the Coyote lease could be more easily accessed by this route than by the routes found in the Proposed Action. The surface pipeline corridor permitted in EA NM-070-93-3006, though consisting of approximately 800 feet of new disturbance, would be considerably easier and less environmentally damaging to maintain as the access to the Hunter Wash No. 1 and Gold No. 1 and No. 2. The access route to the Hunter Wash No. 2 originally requested in Speerex's 1992 APD for that well, would provide a less damaging (and easier to construct) access to the Hunter Wash No. 2 and No. 3 and the Gold No. 3, No. 4, and No. 5, than the currently proposed route to the Hunter Wash No.2 from the Gold No. 1.

Under this alternative, Speerex would have to access their leases by different routes or methods than those proposed. For the purposes of this analysis, it is assumed: that the well pads and on-lease travel routes (with the exception of that to the Barns No. 1 well) would be unchanged from the Proposed Action; that Speerex would choose to access these locations by some surface route; that Speerex can gain ROW easements to its leases without crossing Federal surface within the wilderness; and that Speerex would choose to access the Barns No. 1 well by the route shown on the map "Alternative A" (see Part X).

Given these assumptions, the impacts to Air Quality, Noise, Water, Wildlife, Livestock Grazing, Coal Resources, Oil & Gas Resources, Recreation, and Wilderness Values from this alternative would not be appreciatively different from the impacts generated under the Proposed Action, as mitigated. There would be no difference in Cumulative Impacts. In addition, there would be no impact to Environmental Justice.

Topography & Soils

Qualitatively, the impacts would be similar to those described in the Proposed Action. Known disturbance would come to approximately 21 acres and 13,010 cubic yards. [See Tables in Part IX.] In comparison to the Proposed Action, the engineered routes from Hunter Wash No. 1 to Coyote No. 1 would not be built, reducing impacts to local soils and topography by approximately 8,722 cubic feet; the engineered route to Barns No. 1 from Hunter Wash No. 1 would be replaced by one from Coyote No. 2, reducing impacts by approximately 2,833 cubic yards.

MITIGATIVE MEASURES

Mitigation would be identical to that listed under the Proposed Action.

Vegetation

Qualitatively, the impacts would be similar to those described in the Proposed Action. As mitigated, known disturbance would come to approximately 13.5 vegetated acres.

MITIGATIVE MEASURES

Mitigation would be identical to that listed under the Proposed Action.

Cultural Resources

Qualitatively, the impacts would be similar to those described in the Proposed Action. Alternate routes might impact as yet unsurveyed sites, creating the potential for an unknown amount of impact to these resources.

MITIGATIVE MEASURES

Mitigation would be identical to that listed under the Proposed Action. Cultural surveys of the alternate ROW's would be required prior to construction.

Paleontology

Qualitatively, the impacts would be similar to those described in the Proposed Action. Alternate routes might impact as yet undiscovered paleontological sites, generating an unknown amount of impact to these resources.

MITIGATIVE MEASURES

Mitigation would be identical to that listed under the Proposed Action. Paleontological surveys of the alternate access routes would be required prior to construction.

Visual Resources

The engineered routes from Hunter Wash No. 1 to Barns No. 1 and Coyote No. 1 would not be built. However, the engineered route from Coyote No. 2 to Barns No.1 would be visible from a much greater area than the engineered routes in the Proposed Action, and Alternative A would therefore create greater long-term impact to the visual resources than the Proposed Action.

MITIGATIVE MEASURES

Mitigation would be identical to that listed under the Proposed Action.

Economic Impacts

In addition to the impacts listed under the Proposed Action, there might be additional expense to Speerex in obtaining two additional ROW's to their lease boundaries. Conversely, no off-lease ROW's would be required to be obtained from the BLM. Overall, the economic burden the change in ROW acquisition would place upon Speerex is probably slight.

MITIGATIVE MEASURES

As under the Proposed Action, there would be no mitigative measures.

Irreversible and Irretrievable Commitment of Resources

The irreversible and irretrievable commitment of resources of Alternative A are similar to those in the Proposed Action. There would be the same removal of oil and gas resources; there would be permanent modifications to the topography, though somewhat less than with the Proposed Action.

Mitigative Measures

Mitigation would be identical to that listed under the Proposed Action. Cultural and paleontological surveys of the alternate routes would be required prior to construction.

V. CONSULTATION & COORDINATION

Description of scoping process

Two public scoping meetings were held: February 24, 1998 in Farmington, NM, and February 25, 1998 in Santa Fe, NM.

A Notice of Intent (NOI) to prepare this EIS was published in the Federal Register on January 27, 1998. The NOI included dates, times, and locations of the public meetings. On the same day, ten newspapers and sixteen television and radio stations were sent a news release announcing these meetings.

The BLM announced that comments relating to issue and alternative identification would be accepted though March 20, 1998. Several comments were received after that date.

Results of scoping

Forty-six people registered at each of the two public meetings. Speakers, and other attendees, were encouraged to submit comments in writing on how to balance the preservation of wilderness values with the honoring of valid existing rights associated with oil and gas leases.

These meetings, and the resulting publicity, led to the Farmington BLM office receiving 32 letters before the cut-off date (March 20) and 17 letters after that date. Of the 32 letters received by the cut-off date, 1 was in favor of letting Speerex drill; 25 were opposed to allowing oil and gas development within the B/DNZ, and offered a variety of potential solutions; 3 writers suggested issues or alternatives without appearing to take sides; and 3 writers merely wanted to be placed on the mailing list. Of the letters that arrived after March 20, 16 opposed drilling and 1 (unsigned) favored it. All of alternatives mentioned by any of the writers are addressed or considered and dismissed in PART II -- ALTERNATIVES, above.

Distribution plan for DEIS

This Draft EIS is being sent to:

1) All organizations or companies known to be interested in the management of the Bisti/De-Na-Zin Wilderness or oil and gas production in the San Juan Basin;
2) All individuals known to be interested in the management of the Bisti/De-Na-Zin Wilderness or oil and gas production in the San Juan Basin; and
3) All organizations, companies, or individuals who have asked to be placed on the mailing list for this document.

As of December 1998, there were 194 addresses on this list.

A Federal Register Notice of Availability of this Draft EIS will be published at approximately the same time this document is sent to those on the mailing list. The public will have over 90 days to comment. Public hearings will be held in Farmington, Santa Fe, and Albuquerque during the week of February 22, 1999.

VI. List of Preparers

The following Farmington Field Office personnel in the BLM contributed to the writing of this document:

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The following New Mexico State Office personnel in the BLM contributed to the writing of this document:

Geology; Paleontology	Mike O'Neill	Regional Paleontologist

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VIII. APPENDICES

APPENDIX A: Public Law 104-333, Section 1022

SEC. 1022. BISTI/DE-NA-ZIN WILDERNESS EXPANSION AND FOSSIL FOREST PROTECTION.

Bisti/De-Na-Zin Wilderness Expansion and Fossil Forest Protection Act. New Mexico.

(a) SHORT TITLE.—This section may be cited as the "Bisti/De-Na-Zin Wilderness Expansion and Fossil Forest Protection Act".

(b) WILDERNESS DESIGNATION.—Section 102 of the San Juan Basin Wilderness Protection Act of 1984 (98 Stat. 3155) is amended—

16 USC 1132 note.

(1) in subsection (a)—

(A) by striking "wilderness, and, therefore," and all that follows through "System—" and inserting "wilderness areas, and as one component of the National Wilderness Preservation System, to be known as the 'Bisti/De-Na-Zin Wilderness'—";

(B) in paragraph (1), by striking ", and which shall be known as the Bisti Wilderness; and" and inserting a semicolon;

(C) in paragraph (2), by striking ", and which shall be known as the De-Na-Zin Wilderness." and inserting "; and"; and

(D) by adding at the end the following new paragraph:

"(3) certain lands in the Farmington District of the Bureau of Land Management, New Mexico, which comprise approximately 16,525 acres, as generally depicted on a map entitled 'Bisti/De-Na-Zin Wilderness Amendment Proposal', dated May 1992.";

(2) in the first sentence of subsection (c), by inserting after "of this Act" the following: "with regard to the areas described in paragraphs (1) and (2) of subsection (a), and as soon as practicable after the date of enactment of subsection (a)(3) with regard to the area described in subsection (a)(3)";

(3) in subsection (d), by inserting after "of this Act" the following: "with regard to the areas described in paragraphs (1) and (2) of subsection (a), and where established prior to the date of enactment of subsection (a)(3) with regard to the area described in subsection (a)(3)"; and

(4) by adding at the end the following new subsection:

"(e)(1) Subject to valid existing rights, the lands described in subsection (a)(3) are withdrawn from all forms of appropriation under the mining laws and from disposition under all laws pertaining to mineral leasing, geothermal leasing, and mineral material sales.

"(2) The Secretary of the Interior may issue coal leases in New Mexico in exchange for any preference right coal lease application within the area described in subsection (a)(3). Such exchanges shall be made in accordance with applicable existing laws and regulations relating to coal leases after a determination has been made by the Secretary that the applicant is entitled to a preference right lease and that the exchange is in the public interest.

"(3) Operations on oil and gas leases issued prior to the date of enactment of subsection (a)(3) shall be subject to the applicable provisions of Group 3100 of title 43, Code of Federal Regulations (including section 3162.5–1), and such other terms, stipulations, and conditions as the Secretary of the Interior considers necessary to avoid significant disturbance of the land surface or impairment of the ecological, educational, scientific, recreational, scenic, and other wilderness values of the lands described in subsection (a)(3) in existence on the date of enactment of subsection (a)(3). In order to satisfy valid existing rights on the lands described in subsection (a)(3), the Secretary of the Interior may exchange any oil and gas lease within this area for an unleased parcel outside this area of like mineral estate and with similar appraised mineral values.".

(c) EXCHANGES FOR STATE LANDS.—Section 104 of the San Juan Basin Wilderness Protection Act of 1984 (98 Stat. 3156) is amended—

(1) in the first sentence of subsection (b), by inserting after "of this Act" the following: "with regard to the areas described in paragraphs (1) and (2) of subsection (a), and not later than 120 days after the date of enactment of subsection (a)(3) with regard to the area described in subsection (a)(3)";

(2) in subsection (c), by inserting before the period the following: "with regard to the areas described in paragraphs (1) and (2) of subsection (a), and as of the date of enactment of subsection (a)(3) with regard to the area described in subsection (a)(3)"; and

(3) in the last sentence of subsection (d), by inserting before the period the following: "with regard to the areas described in paragraphs (1) and (2) of subsection (a), and not later than 2 years after the date of enactment of subsection (a)(3) with regard to the area described in subsection (a)(3)".

(d) EXCHANGES FOR INDIAN LANDS.—Section 105 of the San Juan Basin Wilderness Protection Act of 1984 (98 Stat. 3157) is amended by adding at the end the following new subsection:

"(d)(1) The Secretary of the Interior shall exchange any lands held in trust for the Navajo Tribe by the Bureau of Indian Affairs that are within the boundary of the area described in subsection (a)(3).

"(2) The lands shall be exchanged for lands within New Mexico approximately equal in value that are selected by the Navajo Tribe.

"(3) After the exchange, the lands selected by the Navajo Tribe shall be held in trust by the Secretary of the Interior in the same manner as the lands described in paragraph (1).".

(e) FOSSIL FOREST RESEARCH NATURAL AREA.—Section 103 of the San Juan Basin Wilderness Protection Act of 1984 (98 Stat. 3156) is amended to read as follows:

"SEC. 103. FOSSIL FOREST RESEARCH NATURAL AREA.

43 USC 178.

"(a) ESTABLISHMENT.—To conserve and protect natural values and to provide scientific knowledge, education, and interpretation for the benefit of future generations, there is established the Fossil Forest Research Natural Area (referred to in this section as the 'Area'), consisting of the approximately 2,770 acres in the Farmington District of the Bureau of Land Management, New Mexico, as generally depicted on a map entitled 'Fossil Forest', dated June 1983.

"(b) MAP AND LEGAL DESCRIPTION.—

"(1) IN GENERAL.—As soon as practicable after the date of enactment of this paragraph, the Secretary of the Interior shall file a map and legal description of the Area with the Committee on Energy and Natural Resources of the Senate and the Committee on Natural Resources of the House of Representatives.

"(2) FORCE AND EFFECT.—The map and legal description described in paragraph (1) shall have the same force and effect as if included in this Act.

"(3) TECHNICAL CORRECTIONS.—The Secretary of the Interior may correct clerical, typographical, and cartographical errors in the map and legal description subsequent to filing the map pursuant to paragraph (1).

"(4) PUBLIC INSPECTION.—The map and legal description shall be on file and available for public inspection in the Office of the Director of the Bureau of Land Management, Department of the Interior.

"(c) MANAGEMENT.—

"(1) IN GENERAL.—The Secretary of the Interior, acting through the Director of the Bureau of Land Management, shall manage the Area—

"(A) to protect the resources within the Area; and

"(B) in accordance with this Act, the Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701 et seq.), and other applicable provisions of law.

"(2) Mining.—

"(A) Withdrawal.—Subject to valid existing rights, the lands within the Area are withdrawn from all forms of appropriation under the mining laws and from disposition under all laws pertaining to mineral leasing, geothermal leasing, and mineral material sales.

"(B) Coal preference rights.—The Secretary of the Interior is authorized to issue coal leases in New Mexico in exchange for any preference right coal lease application within the Area. Such exchanges shall be made in accordance with applicable existing laws and regulations relating to coal leases after a determination has been made by the Secretary that the applicant is entitled to a preference right lease and that the exchange is in the public interest.

"(C) Oil and gas leases.—Operations on oil and gas leases issued prior to the date of enactment of this paragraph shall be subject to the applicable provisions of Group 3100 of title 43, Code of Federal Regulations (including section 3162.5–1), and such other terms, stipulations, and conditions as the Secretary of the Interior considers necessary to avoid significant disturbance of the land surface or impairment of the natural, educational, and scientific research values of the Area in existence on the date of enactment of this paragraph.

"(3) Grazing.—Livestock grazing on lands within the Area may not be permitted.

"(d) Inventory.—Not later than 3 full fiscal years after the date of enactment of this subsection, the Secretary of the Interior, acting through the Director of the Bureau of Land Management, shall develop a baseline inventory of all categories of fossil resources within the Area. After the inventory is developed, the Secretary shall conduct monitoring surveys at intervals specified in the management plan developed for the Area in accordance with subsection (e).

"(e) Management Plan.—

"(1) In general.—Not later than 5 years after the date of enactment of this Act, the Secretary of the Interior shall develop and submit to the Committee on Energy and Natural Resources of the Senate and the Committee on Natural Resources of the House of Representatives a management plan that describes the appropriate use of the Area consistent with this Act.

"(2) Contents.—The management plan shall include—

"(A) a plan for the implementation of a continuing cooperative program with other agencies and groups for—

"(i) laboratory and field interpretation; and

"(ii) public education about the resources and values of the Area (including vertebrate fossils);

"(B) provisions for vehicle management that are consistent with the purpose of the Area and that provide for the use of vehicles to the minimum extent necessary to accomplish an individual scientific project;

"(C) procedures for the excavation and collection of fossil remains, including botanical fossils, and the use of motorized and mechanical equipment to the minimum extent necessary to accomplish an individual scientific project; and

"(D) mitigation and reclamation standards for activities that disturb the surface to the detriment of scenic and environmental values.".

APPENDIX B: Class II Ambient Air Quality Standards

Pollutant	New Mexico Standard	Federal Primary Standard	Federal Secondary Standard
Total Suspended Particulates (TSP)		none	none
24-Hour Average	150 $\mu g/m^3$		
7-Day Average	110 $\mu g/m^3$		
30-Day Average	90 $\mu g/m^3$		
Annual Geometric Mean	60 $\mu g/m^3$		
Sulfur Dioxide (SO_2)			
24-Hour Average	0.10 ppm	0.14 ppm	
Annual Arithmetic Mean	0.02 ppm	0.03 ppm	
	0.50 ppm		
Carbon Monoxide (CO)			
8-Hour Average*	8.7 ppm	9 ppm	
1-Hour Average*	13.1 ppm	35 ppm	
Ozone (O_3)			
1-Hour Average~		0.12 ppm	0.12 ppm
Nitrogen Dioxide (NO_2)			
24-Hour Average	0.10 ppm		
Annual Arithmetic Mean	0.05 ppm	0.053 ppm	0.053 ppm
Lead (Pb) compounds			
Calendar Quarterly Arithmetic Average		1.50 $\mu g/m^3$	1.50 $\mu g/m^3$
Particulates < 10 Microns			
24-Hour Average~		150 $\mu g/m^3$	150 $\mu g/m^3$
Annual Arithmetic Mean, 3-yr Average		50 $\mu g/m^3$	50 $\mu g/m^3$

$\mu g/m^3$ micrograms per cubic meter

ppm parts per million by volume

* Federal standards not to be exceeded more than once per year

~ Federal Standards not to be exceeded on more than an average of one day per year over a three-year period (see 40 CFR Part 50-National Primary and Secondary Ambient Air Quality Standards).

(Information from New Mexico Environment Department Air Quality Bureau, 1997)

APPENDIX C: Threatened and Endangered Species of San Juan County, NM and Effect Determination

Species	Classification	Effect Determination
Black-footed ferret	Endangered	No Effect
American peregrine falcon	Endangered	No Effect
Arctic peregrine falcon	Threatened	No Effect
Southwestern willow flycatcher	Endangered	No Effect
Bald eagle	Threatened	No Effect
Mexican spotted owl	Threatened	No Effect
Colorado squawfish	Endangered	No Effect
Razorback sucker	Endangered	No Effect
Knowlton cactus	Endangered	No Effect
Mancos milkvetch	Endangered	No Effect
Mesa Verde Cactus	Threatened	No Effect

Black-Footed Ferret (*Mustela nigripes*)

This species is usually associated with prairie dog towns in grassland plains, semi-arid grasslands and adjacent mountain basins. The black-footed ferret historically occurred over most of New Mexico (USDI, BLM 1984). The last confirmed sighting in New Mexico was in 1934 (USDI, BLM 1995). No black-footed ferrets are known to exist other than the captive and reintroduced populations in Wyoming, Montana, South Dakota, and Arizona. However remnant populations may still exist in portions of the former range (*ibid*).

The best information available indicates that the black-footed ferret is apparently extirpated from New Mexico (NMDG&F 1996). The decline in black-footed ferret populations was due mainly to historic extermination of prairie dogs, habitat alterations and major plague outbreaks in the prairie dog populations (USDI, FWS 1988).

No critical habitat has been identified for the black-footed ferret within the proposed project area. The most recent information from the FWS (USDI, FWS 1989) indicates that prairie dog towns of the following sizes are necessary to maintain a black-footed ferret population: (a) 80 acres for black-tailed prairie dogs, and (b) 200 acres for Gunnison's prairie dogs. Gunnison's prairie dogs do inhabit the project area, but towns are widely scattered and no town is larger that 20 acres.

American Peregrine Falcon (*Falco peregrinus anatum*)
Arctic Peregrine Falcon (*Falco peregrinus tundrius*) -- "migration only"

The preferred habitat for the peregrine falcon is generally large cliff areas near water and with relatively dense avian prey species (e.g. waterfowl, passerine birds, shorebirds). Habitat requirements typically include (1) an inaccessible nest site, (2) an adequate prey base, (3) proximity to water and (4) isolation from human disturbances (USDI, FWS 1984). Peregrine falcons typically forage along water sources, and the vast majority of peregrine falcon eyries in the Rocky Mountain/Southwest region are within 1 mile of a stream or river (*ibid*). The main threat to peregrine falcons has been attributed to pesticide use, particularly DDT (*ibid*).

An evaluation for cliff/riparian habitats to support peregrine falcons was conducted within the proposed project area. No suitable cliffs for nesting or riparian/wetland areas (avian prey base) of the size necessary to support peregrine falcons were identified.

Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles are generally associated with medium to large perennial streams, rivers and other water bodies that provide an adequate prey base and appropriate nesting/roosting habitat.

No riparian/wetland habitats to support bald eagles exist within the project area. No foraging habitat (e.g., rivers/streams/waterbodies) and no roosting habitat (e.g., large trees) necessary to support bald eagles were identified.

Brown Pelican (*Pelecanus occidentalis*)

No suitable wetland habitat exists in the project area for brown pelicans.

Mexican Spotted Owl (*Strix occidentalis lucida*)

The Mexican spotted owl occupies mountainous areas, with its preferred habitat consisting of dense, multi-storied forests with moderately closed to closed canopies.

An evaluation for forest/canyon habitats to support Mexican spotted owls was conducted in the project area. No forest/canyon areas necessary to support Mexican spotted owls were identified. No critical habitat has been designated within the project area.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

The Southwestern willow flycatcher is found along riparian habitats (e.g., rivers, streams and wetlands) of the desert Southwest where dense groves of willows (e.g., *Salix, Baccharis* spp.), arroweed, buttonbrush, boxelder and alder are present, often with a scattered overstory of cottonwood (Tibbitts *et al.* 1994). In some locations, exotic plants including tamarisk and Russian olive are also used for nesting. The bird is associated with multi-layered vegetation in close proximity to slack water. The surrounding vegetation of the nesting areas generally ranges from 12 to 21 feet high (*ibid*). Southwestern willow flycatchers breed in habitat where surface water is present (Sferra *et al.* 1995).

An evaluation for riparian/wetland habitats to support Southwestern willow flycatchers was conducted within the project area. No current or potential riparian/wetland areas necessary to support Southwestern willow flycatchers were identified

Colorado Squawfish (Ptychocheilus lucius)
Razorback Sucker *(Xyrauchen texanus*)

The Colorado squawfish and razorback sucker historically inhabited the San Juan River. The Project area is approximately 25 miles from the San Juan River. The proposed project is not expected to appreciably increase sediment into the San Juan River

Knowlton Cactus (*Pediocactus knowltonii*)

Knowlton cactus is only known to exist in northern San Juan County approximately 50 miles from the project area. Plant surveys have been conducted in the project area and no Knowlton cactus or suitable Knowlton cactus habitat exists in the project area.

Mancos Milk-vetch (*Astragalus humillimus)*

Mancos milk-vetch grows on ledges and mesa tops in slickrock communities of the Mesa Verde Group. Plant surveys have been conducted in the project area and no Mancos milk-vetch or suitable habitat for Mancos milk-vetch was found.

Mesa Verde Cactus (*Sclerocactus mesae-verdae)*

Mesa Verde cactus occurs at the eastern edge of the Navajoan Desert in Montezuma County, Colorado, and san Juan county, New Mexico. In general, the Mesa Verde cactus is restricted to the Mancos and Fruitland shale formations. Plant surveys conducted in the project area have not found Mesa Verde cactus or suitable habitat for the cactus.

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APPENDIX D: Cultural Resource Conditions of Approval
Farmington Field Office

PROJECT:________________________________ Report No.________________

_____ 1. DISCOVERY OF CULTURAL RESOURCES IN THE ABSENCE OF MONITORING: If, in its operations, operator discovers any previously unidentified historic or prehistoric cultural resources, then work in the vicinity of the discovery will be suspended and the discovery promptly reported to the BLM District Manager. BLM will then specify what action is to be taken. If there is an approved "discovery plan" in place for the project, then the plan will be executed. In the absence of an approved plan, the BLM will evaluate the significance of the discovery, and consult with the State Historic Preservation Officer in accordance with 36 CFR Section 800.11. Minor recordation, stabilization, or data recovery may be performed by BLM or a permitted cultural resources consultant. If warranted, more extensive treatment by a permitted cultural resources consultant may be required of the operator prior to allowing the project to proceed. Further damage to significant cultural resources will not be allowed until any required treatment is completed. Failure to notify the BLM about a discovery may result in civil or criminal penalties in accordance with the Archeological Resources Protection Act of 1979 (as amended).

_____ 2. DISCOVERY OF CULTURAL RESOURCES DURING MONITORING: If monitoring confirms the presence of previously unidentified cultural resources, then work in the vicinity of the discovery will be suspended and the monitor will promptly report the discovery to the BLM District Manager. BLM will then specify what action is to be taken. If there is an approved "discovery plan" in place for the project, then the plan will be executed. In the absence of an approved plan, the BLM will evaluate the significance of the discovery and consult with the State Historic Preservation Officer in accordance with 36 CFR Section 800.11. Minor recordation, stabilization, or data recovery may be performed by BLM or a permitted cultural resources consultant. If warranted, more extensive treatment by a permitted cultural resources consultant may be required of the operator prior to allowing the project to proceed. Further damage to significant cultural resources will not be allowed until any required treatment is completed.

_____ 3. DAMAGE TO SITES: If, in its operations, operator damages, or is found to have damaged any previously documented or undocumented historic or prehistoric cultural resources, excluding "discoveries" as noted above, the operator agrees at his/her expense to have a permitted cultural resources consultant prepare and have executed a BLM approved data recovery plan. Damage to cultural resources may result in civil or criminal penalties in accordance with the Archeological Resources Protection Act of 1979 (as amended).

_____ 4. SITE PROTECTION AND EMPLOYEE EDUCATION: All employees of the project will be informed that cultural sites are to be avoided by all personnel, personal vehicles and company equipment. They will also be notified that it is illegal to collect, damage or disturb cultural resources.

_____ 5. Monitoring is required.

_____ a. A copy of these stipulations will be supplied to the archeological monitor at least two working days prior to the start of activities.

_____ b. No construction activities, including vegetation removal, may begin before the arrival of the monitor.

_____ c. The monitor will:

_____ 1. Ensure that the site protection barrier is located as indicated on the attached map(s).

_____ 2. Observe all surface disturbing activities within

____

_____ 3. Observe all trenching within

____

_____ 4. Other:

____

_____ 5. Submit a report of the monitoring activities within 30 days of completion of monitoring unless other arrangements are made with the BLM. These stipulations must be attached to the report.

_____ 6. The grantee must select one of the following alternatives:

____ a. Controlled test excavations to determine if cultural resources are present;

____ b. Reduction of the project size to avoid all significant cultural materials;

____ c. Relocation of the project;

____ d. Preparation and implementation of a data recovery plan for site(s)___________

____

_____ 7. SITE BARRIER/FENCING:

____ a. A temporary site protection barrier(s) will be erected prior to_________________ construction. The barrier will consist of upright wooden survey lath spaced no more than 10 feet apart and marked with blue flagging or blue paint. There will be no construction activities or vehicle traffic past the barrier. The barriers(s) will remain in place through reclamation and reseeding.

____ b. A permanent fence(s) will be erected prior to ______________________ construction. There will be no construction activities or vehicle traffic past the fence(s).

____ c. The barrier(s)/fence(s) will be placed as indicated on the attached map(s).

_____ 8. CONSTRUCTION ZONES: There will be a no construction zone______________________

____

_____ 9. OTHER:

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IX. TABLES

PROPOSED ACTION SURFACE IMPACTS (without mitigative measures)

	A ROW length (ft)	B new ROW area (ft^2) (Ax20')	C # of wells	D pad area (ft^2) (Cx150^2)	E pipeline (ft)	F pipeline area (Ex20')	G total new surf. dist. (ft^2) (B+D+F)	H total new surface disturbance (acres)
HUNTER WASH								
existing off-lease	3,251				3,251	65,020	65,020	1.49
existing on-lease	4,093				4,093	81,860	81,860	1.88
proposed on-lease	15,087	301,740	7	157,500	15,087	301,740	760,980	17.47
total (new only)	15,087	301,740	7	157,500	22,431	448,620	907,860	20.84
unvegetated	2,000	40,000	1	22,500	2,000	40,000	102,500	2.35
total vegetated (new)	13,087	261,740	6	135,000	20,431	408,620	805,360	18.49
COYOTE								
on HW lease	3,463	69,260			3,463	69,260	138,520	3.18
off both leases	1,423	28,460			1,423	28,460	56,920	1.31
proposed on-lease	15,848	316,960	6	135,000	15,848	316,960	768,920	17.65
total	20,734	414,680	6	135,000	20,734	414,680	964,360	22.14
unvegetated	7,347	146,940	2	45,000	7,347	146,940	338,880	7.78
total vegetated	13,387	267,740	4	90,000	13,387	267,740	625,480	14.36
GRAND TOTAL								
New	35,821	716,420	13	292,500	43,165	863,300	1,872,220	42.98
Unvegetated	9,347	186,940	3	67,500	9,347	186,940	441,380	10.13
Vegetated	26,474	529,480	10	225,000	33,818	676,360	1,430,840	32.85

NOTE: “Unvegetated” and “Vegetated” lengths and areas are approximations.

PROPOSED ACTION SURFACE IMPACTS (with mitigative measures)

	A ROW length (ft)	B new ROW area (ft^2) (Ax20')	C # of wells	D pad area (ft^2) ($Cx150^2$)	E surf. pipe # of route crossings	F surf. pipe disturbance (Ex20x100)	G total disturbance w/ surf. pipe (B+D+F)	H total disturbance w/ *surf. pipe* (acres)
HUNTER WASH								
existing off-lease	3,251				0	0	0	0.00
existing on-lease	4,093				0	0	0	0.00
proposed on-lease	15,087	301,740	7	157,500	2	4,000	463,240	10.63
total (new only)	15,087	301,740	7	157,500	2	4,000	463,240	10.63
unvegetated	2,000	40,000	1	22,500	0	0	62,500	1.43
total vegetated (new)	13,087	261,740	6	135,000	2	4,000	400,740	9.20
COYOTE								
on HW lease	3,463	69,260			1	2,000	71,260	1.64
off both leases	1,423	28,460			0	0	28,460	0.65
proposed on-lease	15,848	316,960	6	135,000	2	4,000	455,960	10.47
total	20,734	414,680	6	135,000	3	6,000	555,680	12.76
unvegetated	7,347	146,940	2	45,000	3	6,000	197,940	4.54
total vegetated	13,387	267,740	4	90,000	0	0	357,740	8.21
GRAND TOTAL								
New	35,821	716,420	13	292,500	5	10,000	1,018,920	23.39
Unvegetated	9,347	186,940	3	67,500	3	6,000	260,440	5.98
Vegetated	26,474	529,480	10	225,000	2	4,000	758,480	17.41

NOTE: “Unvegetated” and “Vegetated” lengths and areas are approximations.

Proposed Action SUB-SURFACE IMPACTS (without mitigative measures)

All numbers are volumes in cubic yards

	A access route	B pad w/ pit	C buried pipeline	D total new disturbance
Hunter Wash				
HW #2	556	937	1,802	3,295
HW #3	926	2,597	918	4,441
Gold #1	0	1,536	365	1,901
Gold #2	0	1,851	109	1,960
Gold #3	0	1,159	437	1,596
Gold #4	556	1,936	677	3,169
Gold #5	815	878	721	2,414
Total	2,853	10,894	5,029	18,776
Coyote				
Coyote #1	8,722	2,476	1,227	12,425
Coyote #2	0	812	1,184	1,996
Coyote #3	574	648	1,547	2,769
Barns #1	5,926	722	891	7,539
Barns #2	370	1,215	245	1,830
Barns #3	370	2,781	1,817	4,968
Total	15,962	8,654	6,911	31,527
GRAND TOTAL	18,815	19,548	11,940	50,303

NOTE: All volumes are approximations.

PROPOSED ACTION SUB-SURFACE IMPACTS (with mitigative measures)

All numbers are volumes in cubic yards

	A access route	B minimum pad	C surface pipeline	D total new disturbance (mitigated)
HUNTER WASH				
HW #2	556	156	0	712
HW #3	926	810	0	1,736
Gold #1	0	486	0	486
Gold #2	0	208	33	241
Gold #3	0	668	33	701
Gold #4	556	257	0	813
Gold #5	815	248	0	1,063
Total	2,853	2,833	66	5,752
COYOTE				
Coyote #1	8,722	694	0	9,416
Coyote #2	0	347	0	347
Coyote #3	574	139	33	746
Barns #1	5,926	278	33	6,237
Barns #2	370	266	33	669
Barns #3	370	833	0	1,203
Total	15,962	2,557	99	18,618
GRAND TOTAL	18,815	5,390	165	24,370

NOTE: All volumes are approximations.

ALTERNATIVE A SURFACE IMPACTS

	A ROW length (ft)	B new ROW area (ft^2) (Ax20')	C # of wells	D pad area (ft^2) (Cx150^2)	E surf. pipe # of route crossings	F surf. pipe disturbance (Fx20x100)	G total new surface disturbance (ft^2) (B+D+G)	H total new surface disturbance (acres)
HUNTER WASH								
existing off-lease	0	0		0	0	0	0	0.00
existing on-lease	3,264	0		0	0	0	0	0.00
proposed on-lease	12,005	240,100	7	157,500	2	4,000	401,600	9.22
total (new only)	12,005	240,100	7	157,500	2	4,000	401,600	9.22
unvegetated	2,500	50,000	1	22,500	0	0	72,500	1.66
total vegetated (new)	9,505	190,100	6	135,000	2	4,000	329,100	7.56
COYOTE								
on HW lease	0	0			0	0	0	0.00
off both leases	0	0			0	0	0	0.00
proposed on-lease	18,791	375,820	6	135,000	2	4,000	514,820	11.82
total	18,791	375,820	6	135,000	2	4,000	514,820	11.82
unvegetated	10,347	206,940	2	45,000	2	4,000	255,940	5.88
total vegetated	8,444	168,880	4	90,000	0	0	258,880	5.94
GRAND TOTAL								
New	30,796	615,920	13	292,500	4	8,000	916,420	21.04
Unvegetated	12,847	256,940	3	67,500	2	4,000	328,440	7.54
Vegetated	17,949	358,980	10	225,000	2	4,000	587,980	13.50

NOTE: “Unvegetated” and “Vegetated” lengths and areas are approximations.

ALTERNATIVE A SUB-SURFACE IMPACTS

All numbers are volumes in cubic yards

	A access route	B pad	C pipe	D total
HUNTER WASH				
HW #2	0	156	0	156
HW #3	926	810	33	1,769
Gold #1	0	486	0	486
Gold #2	0	208	33	241
Gold #3	0	668	0	668
Gold #4	556	257	0	813
Gold #5	815	248	0	1,063
Total	2,556	2,824	66	5,446
COYOTE				
Coyote #1	574	694	33	1,301
Coyote #2	0	347	0	347
Coyote #3	0	139	0	139
Barns #1	3,093	278	0	3,371
Barns #2	370	266	33	669
Barns #3	370	833	0	1,203
Total	4,407	3,124	33	7,564
GRAND TOTAL	6,963	5,948	99	13,010

NOTE: All volumes are approximations.

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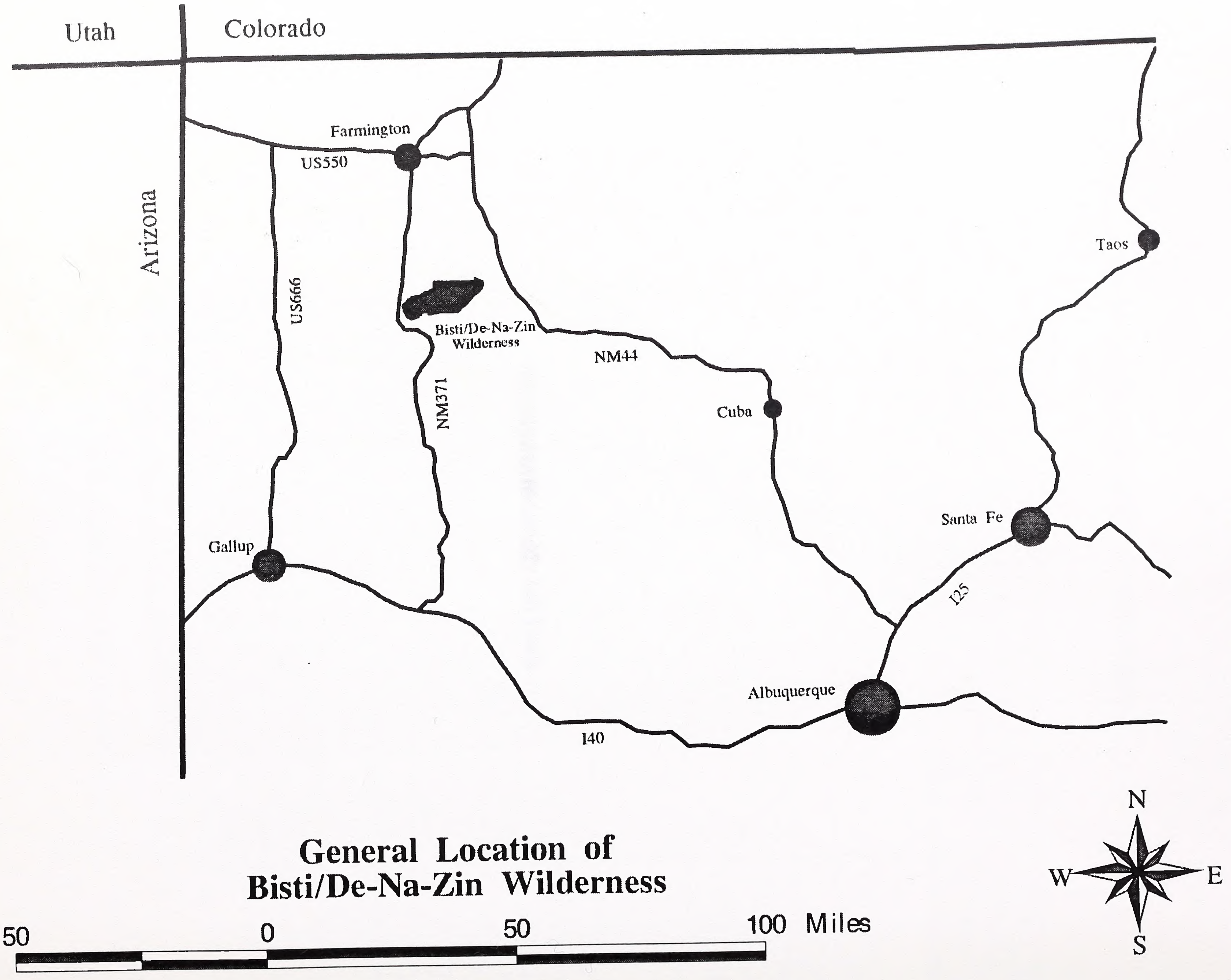
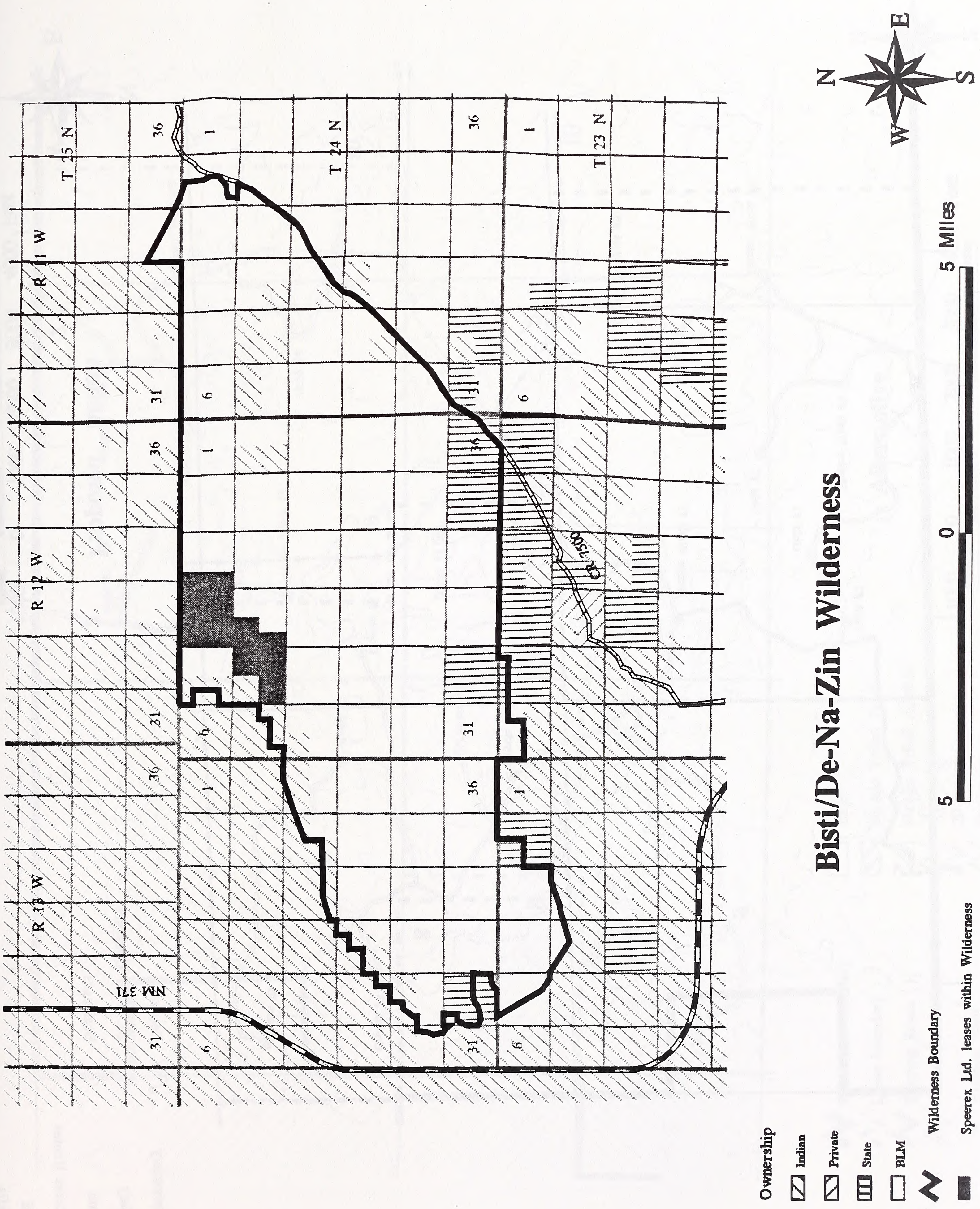
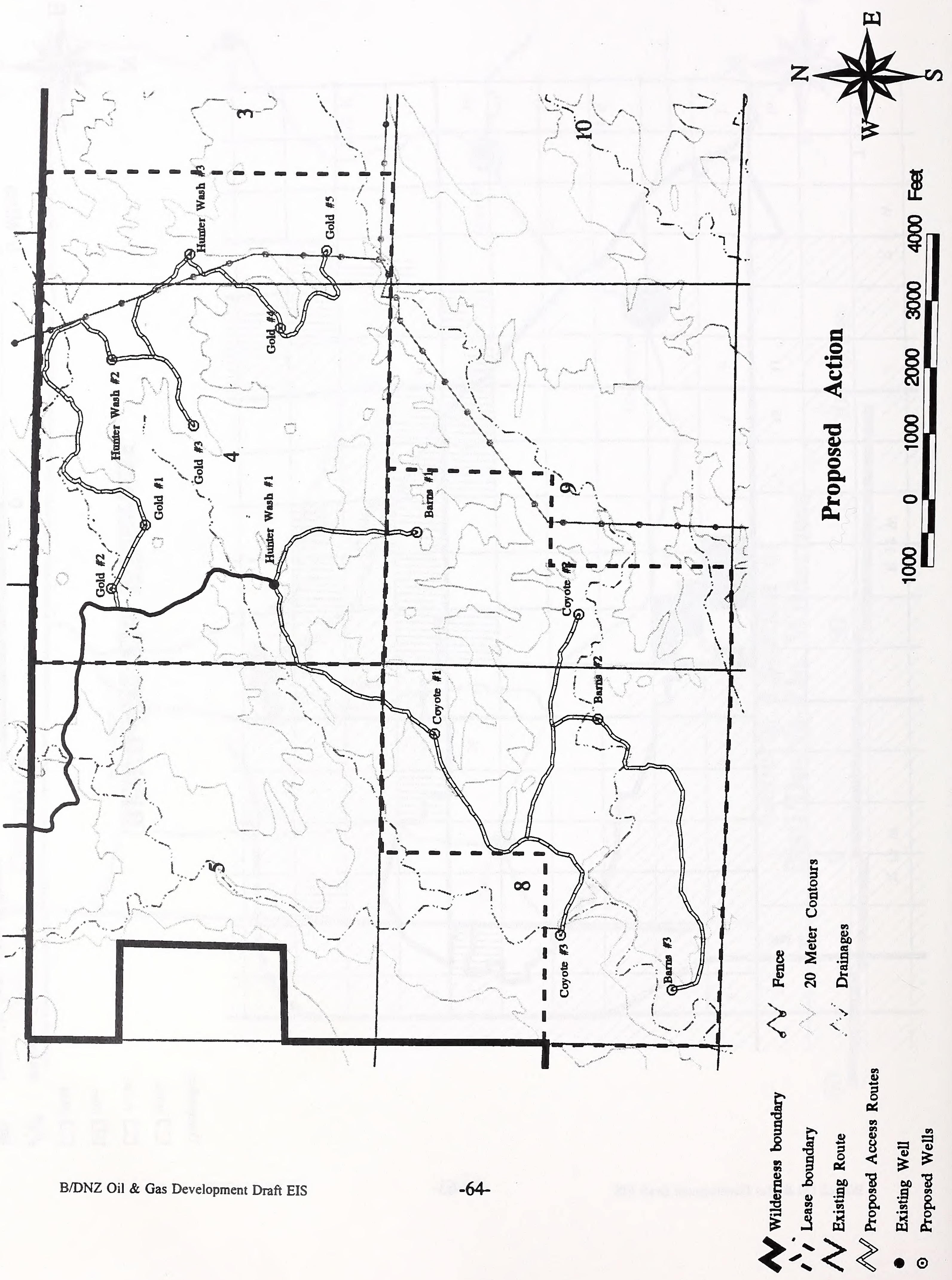
X. MAPS



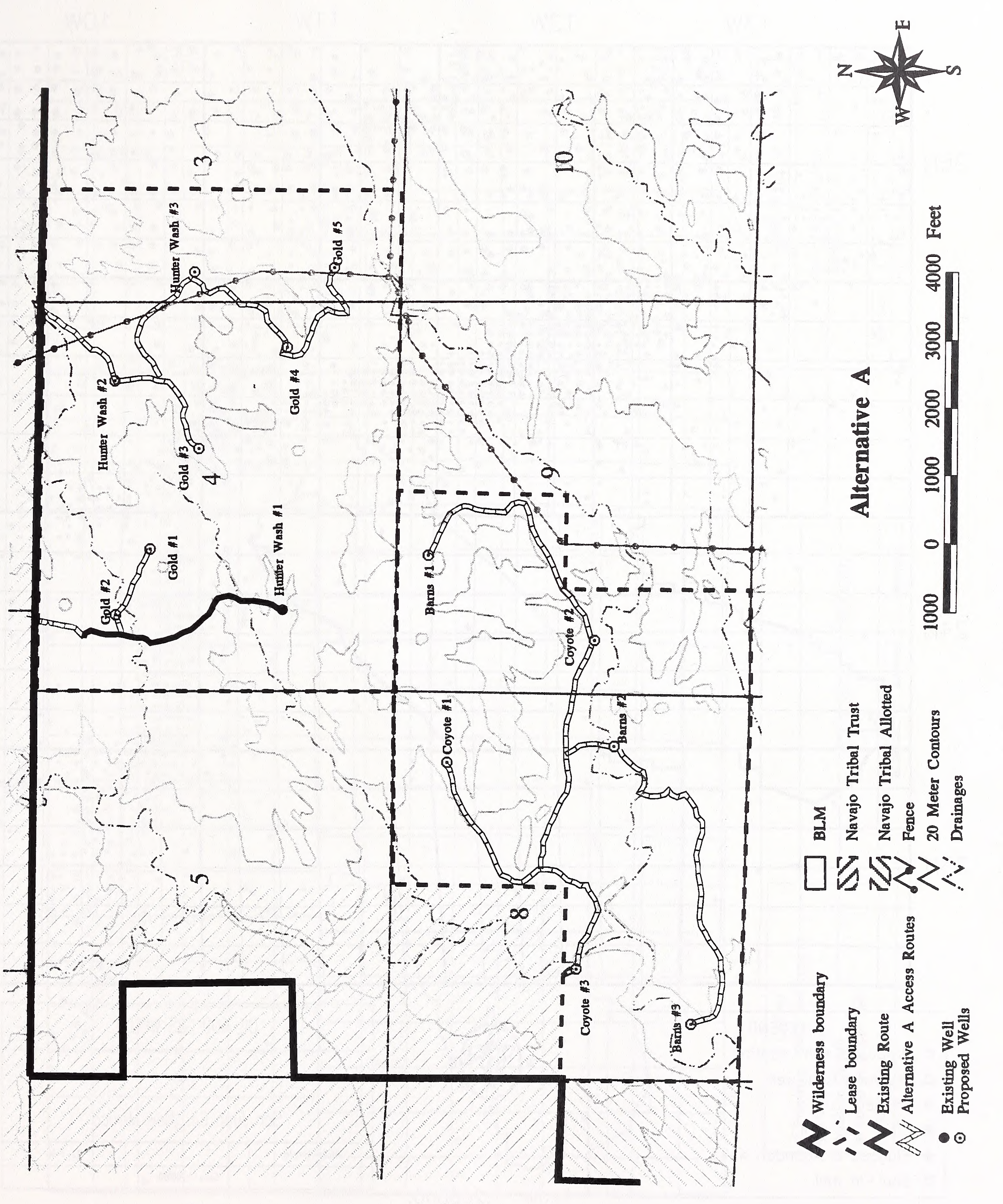
General Location of Bisti/De-Na-Zin Wilderness



Bisti/De-Na-Zin Wilderness



Proposed Action


Alternative A
Hunter Wash #1
Hunter Wash #2
Hunter Wash #3
Gold #1
Gold #2
Gold #3
Gold #4
Gold #5
Barns #1
Barns #2
Barns #3
Coyote #1
Coyote #2
Coyote #3
3
4
5
8
9
10
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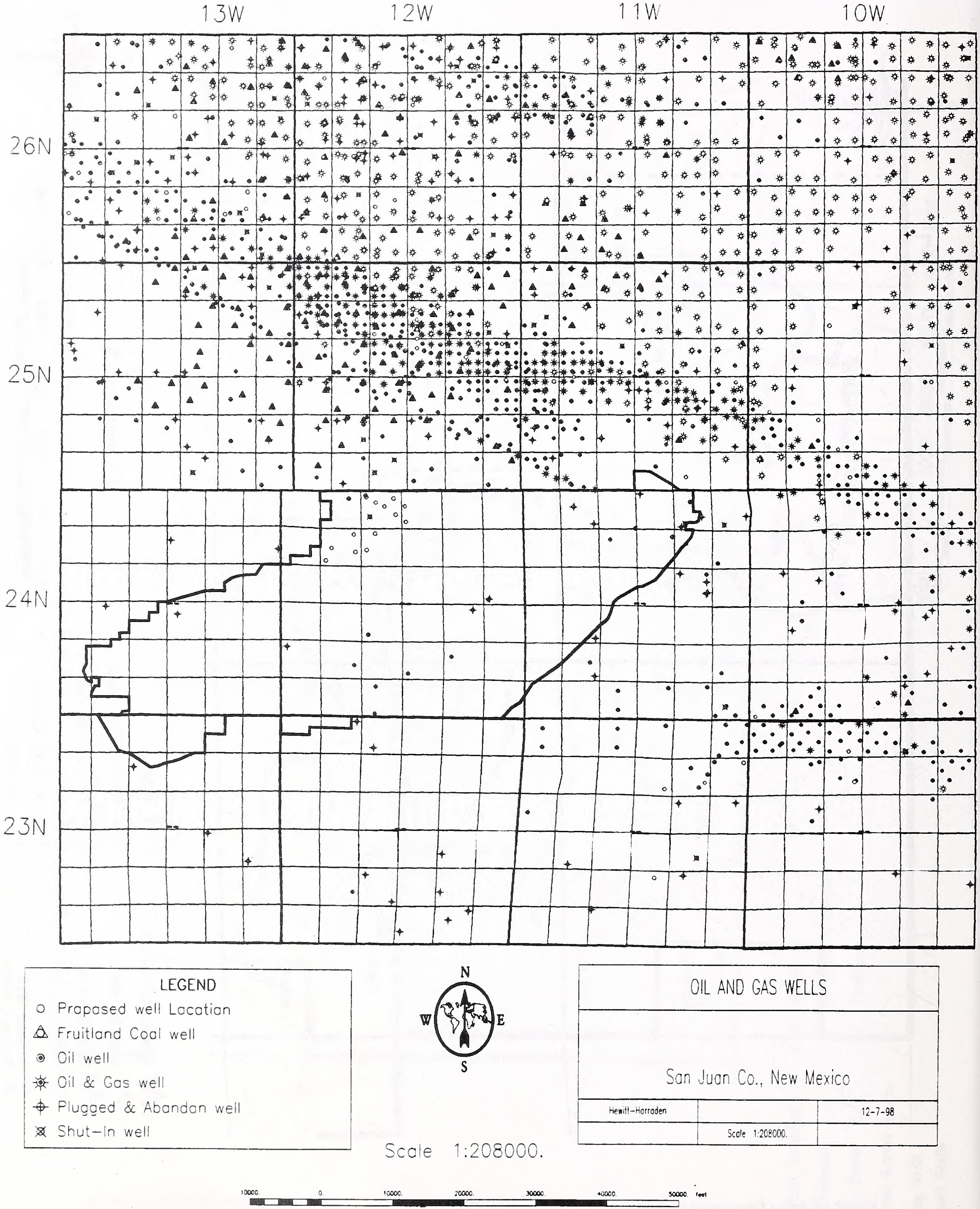
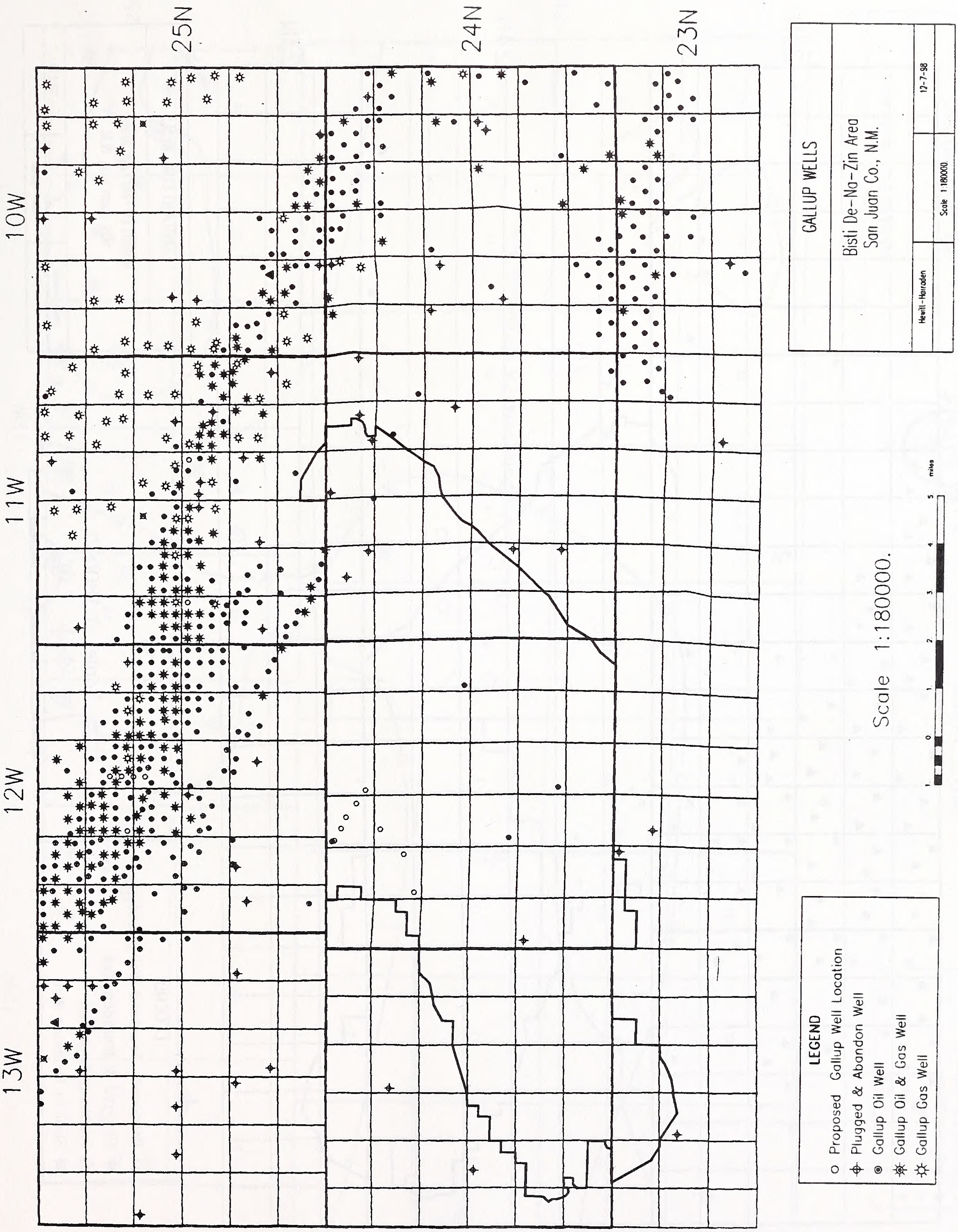
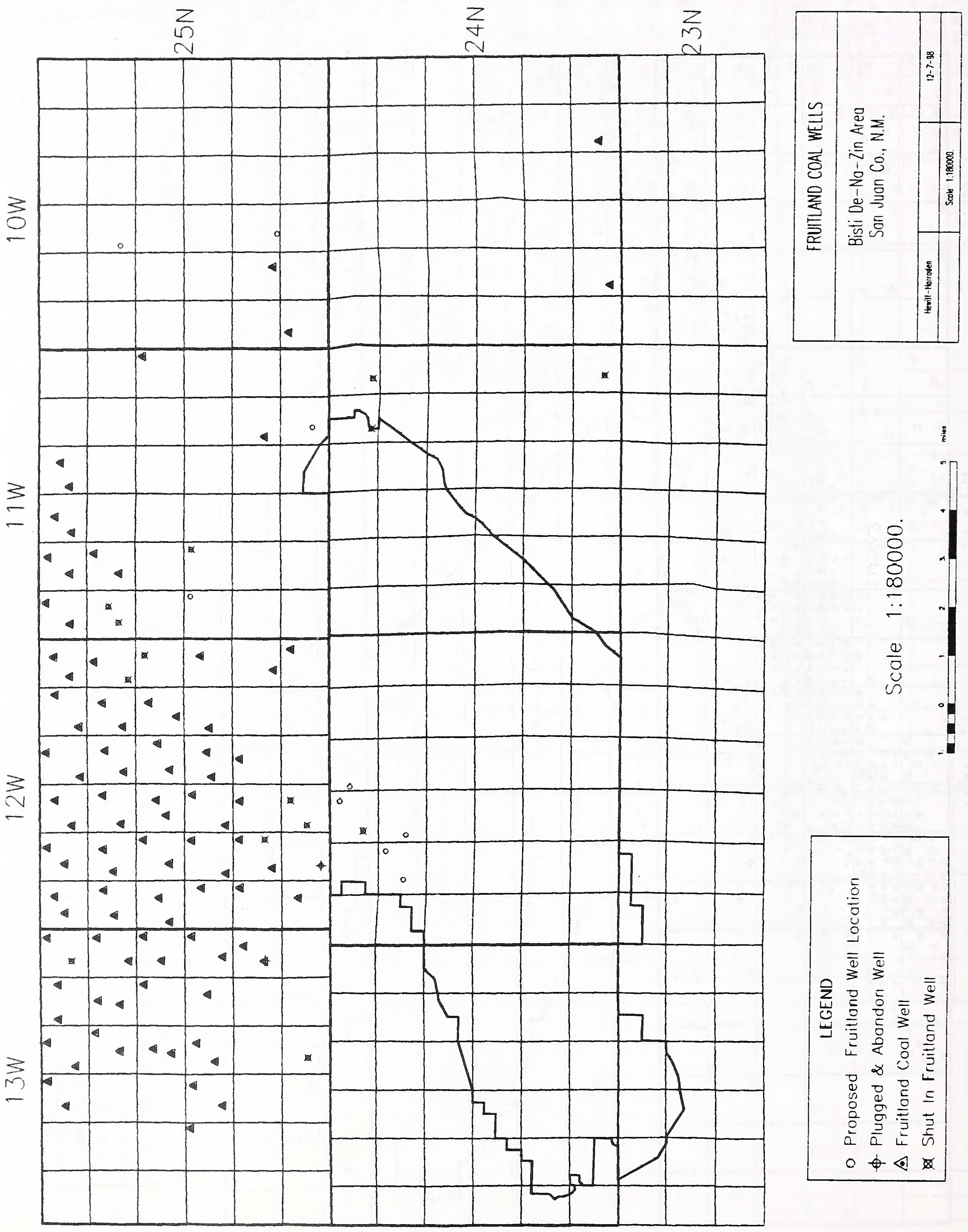
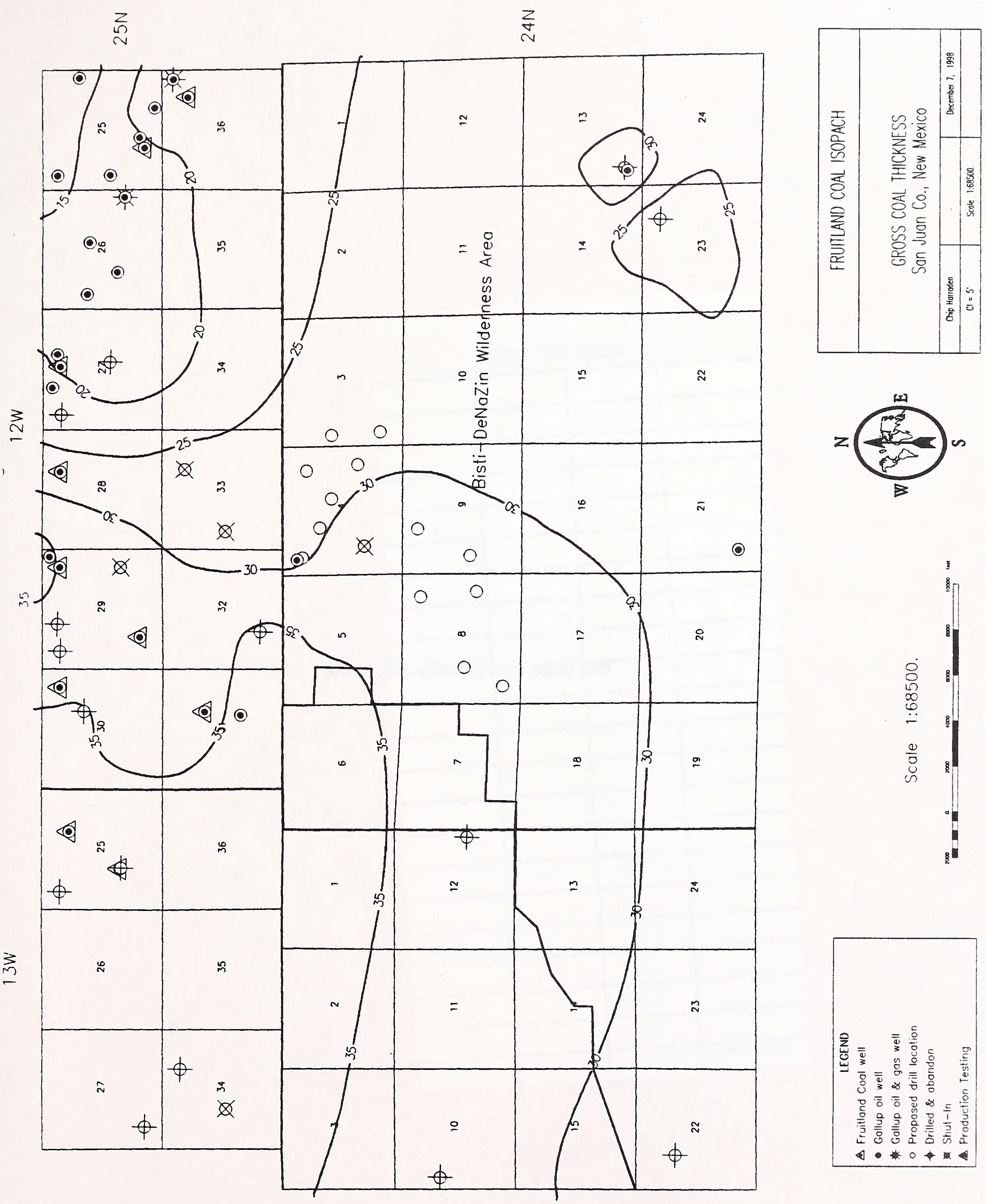
S
W
1000
0
1000
2000
3000
4000
Feet
Wilderness boundary
Lease boundary
Existing Route
Alternative A Access Routes
Existing Well
Proposed Wells
BLM
Navajo Tribal Trust
Navajo Tribal Allotted
Fence
20 Meter Contours
Drainages


13W
12W
11W
10W
26N
25N
24N
23N
LEGEND
○ Proposed well Location
△ Fruitland Coal well
◉ Oil well
☼ Oil & Gas well
⊕ Plugged & Abandon well
☒ Shut-In well
N
W
E
S
OIL AND GAS WELLS
San Juan Co., New Mexico
Hewitt-Harraden
12-7-98
Scale 1:208000.
Scale 1:208000.
10000.
0
10000.
20000.
30000.
40000.
50000.
feet


GALLUP WELLS

Bisti De-Na-Zin Area
San Juan Co., N.M.


13W
12W
11W
10W
25N
24N
23N
FRUITLAND COAL WELLS
Bisti De-Na-Zin Area
San Juan Co., N.M.
Hewitt-Harraden
Scale 1:180000.
12-7-98
Scale 1:180000.
1 0 1 2 3 4 5 miles
LEGEND
○ Proposed Fruitland Well Location
⌖ Plugged & Abandon Well
▲ Fruitland Coal Well
☒ Shut In Fruitland Well


FRUITLAND COAL ISOPACH
GROSS COAL THICKNESS
San Juan Co., New Mexico
Chip Harraden
December 7, 1998
CI = 5'
Scale 1:68500.
25N
24N
12W
13W
Bisti–DeNaZin Wilderness Area
N
E
S
W
Scale 1:68500.
LEGEND
▲ Fruitland Coal well
● Gallup oil well
✹ Gallup oil & gas well
○ Proposed drill location
✦ Drilled & abandon
☒ Shut-In
▲ Production Testing
15
20
25
30
35

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DATE DUE

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